University of Stavanger

Faculty of Science and Technology

MASTER'S THESIS

Study programme/Specialization: **Offshore Technology/Industrial Asset Management**	Spring semester, **2012** Open access
Author: **Nurdan Eren Thalji**	..... (Author's signature)

Faculty supervisor**: Prof. Jayantha P. Liyanage (Faculty of Science and Technology, UiS)**

External supervisor(s): **Heidi Korhonen (VTT Technical Research Centre of Finland)**

Title of thesis:

Sustainability-based development of local food service in a hypermarket context: A case study in Finland

Credits (ECTS): **30**

Key words: *local food, sustainability, service development, co-development, food retailing, supermarket, hypermarket, systems engineering, case study, Finland*	Pages: **58** + enclosure: **2** **Stavanger** **11.06.2012**

PREFACE

Dear reader, this thesis is conducted within the scope of an on-going research project, SHAPE, at VTT Technical Research Centre of Finland. It serves to aim of shaping the market in terms of sustainability. Therefore, it calls for sustainable actions starting from production to consumption in the centre of a large retailer, the case hypermarket in Finland. The local food service of the hypermarket is investigated and developed in order to sustain its economic, social and environmental performance.

I would like to express that this study investigates ways how to enable a more sustainable local food service in a hypermarket context and make it visible for their business. Its focus is enhancing the sustainability degree of the existing local food service rather than proving that the local food service is the most sustainable way for food retailing.

On the other hand, a number of different perspectives about sustainability of supermarkets / hypermarkets already exist: some argue that they have become the monopoly in the market and kill the small retailers; so they are against sustainability by nature, while others refer to necessity of them in order to satisfy modern society needs. Among those different views, we direct out objective to the below saying:

"When the winds of change start to blow, some people begin to build wind breakers, but others build windmills" (public wisdom)

…and decide taking a step towards building windmills…

Happy reading!

11.06.2012

ACKNOWLEDGEMENT

I would sincerely thank everybody, who (un)knowingly contributed to my master and thesis by being in my life during the construction period of it, spring 2012:) Some special ones have privilege though:

Dear Prof. Jayantha P. Liyanage, thank you for your support & trust to my remote-thesis-building period and comments that I've learned through…

Dear Marko Laaksonen, thank you for your experience-based insights and willingness to co-develop, the work would remain just on paper without your commitment and practical thoughts…

Dear Heidi Korhonen and Tiina Valjakka you are great ladies that make me stand confidently and overcome the monster, thank you!…

Thank you Veikko Ikonen, Markku Mikkola and Iiro Salkari for making my stay possible at VTT Technical Research Centre of Finland and thank you all TK308 for hosting me. Dear Jari Kettunen apologies to you that we couldn't give you hand to hold on life, rest in peace…

Would somebody else than a real soul mate stand by me during all those challenges? Shukran my IDriss!

Hayatimin bu devresini de fiziki mesafelere karsin gönulleriniz gönlumde gecirdim ya Rab'ime hamd olsun…Ilk gunden itibaren desteginiz nefesim, özleminiz azmim…Annem Nurcihan, babam Rumi ve karindasim Nilay'im sonsuz tesekkurler…

Finally, thanks to all borderless hearts in Istanbul, Amman, Växjö, Stavanger, Helsinki and Espoo, who have a touch in my existence so far…keep living good now days!

People are always asking about the good old days. I say, why don't you say the good now days? ~Robert M. Young

nurdan eren thalji

11.06.2012

Table of Contents

ABSTRACT

Food retailing is one of the most diverse and dynamic sectors in developed societies, offering a seemingly increasing range of food and services to consumers. Food retailers have recently started taking sustainable initiatives according to their business rationales. Local food is one of these initiatives, which means growing, producing and consuming food in the same region. The reason behind retailers' support for local food routes into the retailer market is increased customer demand and response to public criticism.

The following business needs should therefore be considered when local food is examined in a large food retailer, hypermarket, context: i) the need for sustainability performance measures for local food service scenario assessment in order to meet the customer's and public's expectations, ii) the need for co-development of local food service in order to stabilize demand and supply of local food, and iii) the need for a marketing concept in order to visualize the values associated with local food.

The purpose of the thesis is to introduce sustainability aspects and operationalize sustainability by involving these in the local food service development process in a hypermarket.

The case hypermarket has been purposefully selected in order to investigate the service development needs and validate the developed model in a real context. The hypermarket is located in the Lahti region, Finland.

The thesis has two main results: a sustainability-enhanced local food (SELF) development model and an enhanced local food service (LFS) scenario with a co-developed marketing concept and sustainability performance indicators.

Its implication is in terms of considering sustainability in stakeholders' needs, sustainability assessment criteria, an LFS scenario, service concepts, functions, and sustainability performance indicators. Taking into account the stakeholders' needs and perspective on sustainability, developing recognizable and understandable sustainability measures for them and presenting co-development platforms enhances a common understanding of sustainability and lets it be alive, dynamic and adds value for stakeholders in retailing. As the common understanding matures, commitment and support for sustainable actions increase. Hypermarkets have the advantage of connecting consumers and local producers at this point. They have the power to shape the market in a sustainable way.

Keywords: *local food, sustainability, service development, co-development, food retailing, supermarket, hypermarket, systems engineering, case study, Finland*

ABBREVIATIONS

LF: Local food

LFS: Local food service

LCP: Life cycle processes

FSC: Food supply chain

ICT: Information and communication technologies

IDEF0: Integration definition for function modelling

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

Food retailing is one of the most diverse and dynamic sectors in developed societies, offering a seemingly increasing range of food and services to consumers. Food retailers have recently started taking sustainable initiatives according to their business rationales, such as searching for alternative ways versus food miles, e.g. supplying local food or reducing the complexity of food networks, which has mostly been concerned with economics. Sustainability clearly points to a much wider perspective than just economics, yet it has to be aligned with economic performance, operationally, to uphold its commitment to people and continuity of actions (Ilbery & Maye 2005).

Sustainability-based development is therefore a major step in a hypermarket context, especially in a country like Finland, where very few hypermarket chains drive the retailing activities and there is a need for co-development to satisfy the growing customer demand for local food (Honkasalo 2011).

1.1 Background

Local food has raised as a recent alternative food network due to different needs and trends in contexts. There are two main perspectives on the topic: Khan (2010) conceives local food initiatives as basic food access enablers that provide easy access and fresh and cheap food to people, while Norberg-Hodge and Gorelick (2002) propose that local food is a driver of sustainable food with diversity of species that encourages organic methods in agriculture, earns money for the farmer instead of the corporate middlemen and leads to overall local development. On the other hand, Dunne et al. (2010) declare that the reason behind the retailers' support for local food routes into the retailer market is increased customer demand and response to public criticism (e.g. becoming a monopoly in the market, leading to a reduction in the number of independent retailers).

Moreover, the local food market is growing as consumer awareness of environmental issues and social equity increases. Roininen et al. (2006) mention political support, urbanization, expressing values through consumption, increased concern about food quality and safety, and management of environmental risks as influencing factors for sustainable food chains and the emergence of local food.

1.2 Challenges and problem discussion

Ilbery and Maye (2006) point to the role of supermarkets in reconfiguring the supply chains by developing sophisticated outlets and distribution centres; hence, they have the power to shape food supply chains towards sustainability. Jones et al. (2005) point out the necessity of sustainable actions for supermarkets to survive and grow in a market in which customer values, expectations and demand have so far been formed by increased awareness of the emerging consequences of production and consumption attitudes.

Marketing local food in a hypermarket as an attempt at sustainability is challenging however. The challenge is basically due to the conflict between the divergent image of local food and the hypermarket.

The following business needs should therefore be considered when local food is examined in a hypermarket context: i) the need for sustainability performance measures for local food service scenario assessment in order to meet the customer's and public's expectations, ii) the need for co-development of local food service in order to stabilize demand and supply of local food, and iii) the need for a marketing concept in order to visualize the values associated with local food.

Retailing of local food calls to mind small, simple platforms on which local producers and consumers meet and exchange value. It presents organic, high quality, traceable and trustworthy food and embraces support for the local economy, farmers and producers; preserves the environment, etc. Adversely, the image of a hypermarket is as a big, complex structure with access to various levels of quality and price, and products besides food, with human interaction at a minimum. It is a giant hunter, and no matter how clever you are, you are pursued at every opportunity and exposed to carrying full bags and emptying your wallet. You never know where and to whom your money goes or for what purpose it is used. Tomatoes that have flown thousands of miles or for which people have worked over 15 hours a day in inhumane conditions somewhere on earth are issues to which we are all blind when we see the hypermarkets' fancy and welcoming brochures.

Based on the above points, increased customer demand and public criticism are also challenges that face hypermarkets besides being reasons for local food retailing, as stated earlier by Dunne et al. (2010). A stable supply, satisfied customers and managing operating and holding costs are issues that arise from growing customer demand, whereas the need to pay more attention to sustainable action – such as supporting local people and the economy – arises in order to overcome public criticism.

According to Mäkipeska & Sihvonen (2010), food retailers have been focusing on efficiency in logistics and operations, and researchers have driven the discussion on production and supportive action in the food supply chains so far, while business development and marketing have been neglected.

1.3 Scope and objective of the thesis

In summary, retailers are willing to improve their understanding of sustainability as long as it adds value to their business and is practically applicable (Jones et al. 2008). They are also convinced that they need to develop in a profitable way together with their stakeholders (Jones et al. 2005). At this point, there is a need to present and operationalize sustainability aspects in a way the retailers understand, so they can apply this understanding to their businesses in a beneficial way, such as in their marketing strategies (Arponen & Ottelin 2011).

The thesis therefore proposes a sustainability-based service development model for local food and applies it to a hypermarket in Finland in order to answer the following research question:

- How can sustainability add value to local food service development in a hypermarket context?

The purpose of the thesis is to introduce sustainability aspects and operationalize sustainability by involving these aspects in the service development process. Thus, the common understanding of stakeholders in local food retailing will be enriched and, hopefully, act as a catalyst for the co-development of local food in a hypermarket context in which local food is considered an important part of the service business and is used as a marketing concept with sustainability performance criteria.

1.4 Methodology and limitations

The thesis is based on a case study conducted in a subsidiary hypermarket of a giant hypermarket chain in Finland. It sheds light on a sustainable service development process in a local food supply chain. Its originality lies in adding value to a sustainable local food supply chain from a retailer perspective, beyond identifying, assessing and criticizing the sustainability of the current local food supply chain and the services involved. It emphasizes the importance of service co-development activities to reach sustainability targets effectively.

- *Chapter 1* introduces the theme, discusses the scope and the problem, and clarifies the objective, method and limitations of the study.
- The methodology is described and elaborated research design presented in *Chapter 2*.
- Theoretical background about the concepts is given in *Chapter 3*.
- *Chapter 4* explains the stages of SELF developed model.
- Information regarding case hypermarket and its stakeholders is given in *Chapter 5*.
- Information based on empirical findings is analysed by following the SELF development model modules, results of the analysis are presented in *Chapter 6*.
- *Chapter 7* discusses the work done so far; from different perspectives, challenges met during the work and foreseen studies are also reflected.
- *Chapter 8* answers the research question and presents the implication of the study.

The study is limited to one group of offerings, which includes vegetables, and a single case study. The group selection was done in agreement with the shopkeeper according to three criteria: there was more than one supplier for the product group, there were local and conventional (non-local) suppliers, the group could make a difference compared with other hypermarkets/supermarkets due to its locality advantage. In this sense, beer could be interesting, but it would be challenging to fit previous research to such a study; fish is only seasonally available and there is insufficient information about local suppliers in the region; and dairy products might require a change in customers' quality perception, which is only partially mentioned in this thesis.

2. RESEARCH DESIGN

My steps for the research design are outlined in logical order below and the design phases are illustrated in Figure 1 at the end of the chapter.

2.1 Shaping the research topic and literature review

Based on the case hypermarket's expectations, I have investigated ways to consider and operationalize sustainability in local food service development for a hypermarket. My research question is therefore a *how* question.

How and *why* questions mostly recall explanatory design in which histories, case studies or experiments are likely to be the research strategies. Thus, e*xplanatory design* is used as the study deals with operational links, which need to be traced over time rather than frequencies or incidences, as stated by Yin (2003). Beyond this, the study has *descriptive* parts that introduce the existing local food service scenario to the case hypermarket.

Yin (2003) states that the purpose of a literature review is commonly thought to be to obtain information on what is known about a topic, whereas experienced investigators use it to develop sharper and more insightful research questions. Hence, the literature review took rather a long time and required detailed investigation during the study, since I have paid special attention to not misinterpreting the literature review, as many others do. In brief, I have used the literature review to formulate the research question as well as to gain insights into the topic.

I have mainly used databases from the online libraries of the universities in Växjö and Stavanger for the literature review. The review took about one month, from mid-February to end of March 2012. Emerald and Science Direct were the main databases for the search. Even though the search was limited to the period 1980 to 2012, the results that came up belonged to the last decade and not the earlier period. Hence, I am convinced that that the study topics are current, having been developed very recently.

I started my search with 'local food/sustainable food/food sustainability, retailing' keywords together with 'Finland' but found insufficient results. When I searched different combinations of the same terms in title-abstract keywords, I found a number of studies. The detailed search and results are shown in Table 1.

Table 1. Literature review results

		Science direct			Emerald		
Tit-abs-keyword	**Keywords**	**match**	**view**	**appr.**	**match**	**view**	**appr.**
	Finland & local food	0	0	0	0	0	0
	Finland & sustainable food	0	0	0	0	0	0
	Finland & food sustainability	1	0	0	0	0	0
	Finland & retailing	6	1	0	10	5	0
	sustainability & local food	5	2	2	0	0	0
	sustainable food systems	10	1	1	20	5	2
Finland & local food		9	1	1	2	1	1
Finland & food sustainability		5	5	0	0	0	0
Finland & food supply chain		4	4	0	0	0	0
Finland & organic food		18	15	0	0	0	0
Finland & sust. product. & consump.		15	2	1	0	0	0
sustainability & local food		108	20	6	11	4	3
sustainability & supermarket		5	1	0	3	1	1
local food & supermarket		49	5	1	9	0	0
food supply chain & sustainability		26	3	1	4	2	2
local food & supermarket		51	3	1	11	2	0
food supply chain & supermarket		17	0	0	0	0	0
sustainable supply chain & supermarket		2	0	0	0	0	0
sustainability & supermarket		5	0	0	0	0	0
sustainable food supply chain		40	4	1	6	4	2

2.2 Justification of research strategy

This is a case study as it examines contemporary events, unlike histories (histories examine past – dead – events) in their real context that cannot manipulate relevant behaviours, and unlike experiments (experiments are when relevant behaviours are manipulated in laboratory settings). In view of Yin (2003), the case study is also expressed as a distinctive strategy when

a how *or* why *question is being asked about a contemporary set of events over which the investigator has little or no control.*

The study is a single case study that was purposefully selected as *typical* and *representative*. I believe that an examination of the circumstances and conditions of a representative hypermarket and the lessons learned from such a case are informative for the average supermarkets/hypermarkets in similar contexts. Comparative and multi-case studies would, of course, increase the reliability of the study.

2.3 Data collection

An *embedded unit of analysis* is used, as the local food service in the food store in the supermarket context is the main unit investigated.

Multi-sources of evidence are used in the data collection. *Documentation* is the main data collection method, as much documented material has been used from research papers, newspaper clippings, emails, meeting notes, supermarket web pages, etc. The list of local suppliers and related information, and service records in the supermarket's database are examples of *archival records* used. A semi-structured *interview* has been carried out with the

shopkeeper at the supermarket. There was also a chance for *direct observation* and participation during the workshop with the shopkeeper.

2.4 Analysis and modelling

Theoretical propositions are used as a general analytic strategy in the study. They are introduced in the theory chapter. The case is described in the empirical findings, and the SELF development model has emerged based on theoretical propositions and case-related needs.

The analysis is conducted with regard to the service development process, and the roadmap for the analysis is the SELF-development model steps, which originate from the standard systems engineering process.

Within the general analytic strategy, pattern matching and explanation building are used. The model is applied to a case in order to find the answer to the research question. Rival explanations and results are used as patterns. Explanation building is chosen due to its iterative nature and relevance to explanatory studies. In essence, the case evidence is examined, theoretical propositions are revised, and the evidence is examined again, iteratively, from a new perspective.

2.5 Reliability and validity

According to Yin (2003), validity is about setting up operational measures to meet the objectives of the study. The validity of the study can be increased by three different strategies. The first strategy is to use different sources during data collection. The second strategy is to set up an order and interactions between different data collection methods, and the last strategy is to have a plan with keywords while presenting the results of study.

In this thesis, different sources of data are used. The collected data are used to break down the system, develop and integrate it. Interactions are important.

Furthermore, the research plan and accuracy of the collected data are checked with the project team and the shopkeeper in a meeting and workshop in order to ensure *internal validity*. The selection of a typical hypermarket in Finland, considering the food groups and rationale for choosing vegetables, and elaborated interpretations in the discussion chapter regarding the generality of the study increase the *external validity*.

Reliability concerns checking if another researcher can perform the same case study and reach the same outputs using previous research methods or not. The aim of reliability is to reduce the errors and biases of the study.

The SELF development model is the framework to guide the author of the thesis through the development process. It is used to explain the modules and maintain the same structure through the thesis. Errors and biases are prevented by validating the data and steps. The following researchers are referred to the SELF development model to perform the same study and obtain the same outputs. Moreover, it gives a chance of application to other cases, as the modules are described in general terms and with their characteristics.

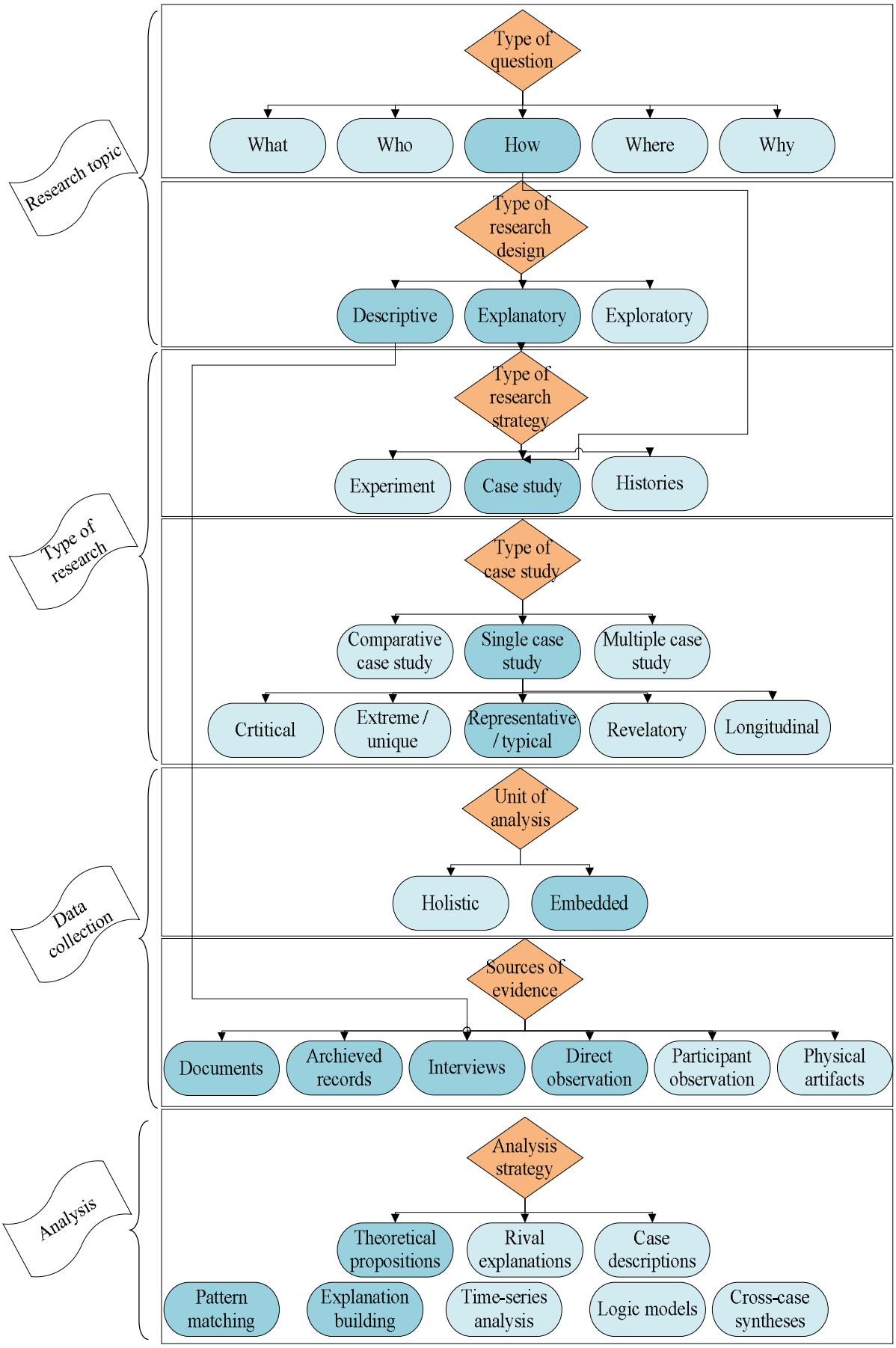


Figure 1. Research design of the thesis

3. THEORETICAL BACKGROUND

This chapter introduces the concepts I have used frequently. It also provides an overview of the methods I used when I built the model and applied it to the analysis.

My aim is to provide the core idea of the concepts, methods and related aspects of my work from different perspectives rather than a huge amount of writing. I hope this will make it easier to follow the work in the analysis and contribute knowledge on the topic.

3.1 Sustainability and service economy

3.1.a Definition and aspects of sustainability

Sustainability was introduced in the Brundtland Commission's report (UN 1987) within the definition of sustainable development:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

According to Labuschagne et al. (2005) and Aras and Crowther (2008), there are four aspects to recognize and analyse with regard to the sustainability issue, as introduced by the UN: *societal influence, environmental impact, organizational culture* and *finance*. Most researchers use the 'triple bottom line' approach argued by Elkingtan (1998) and stated in Marlow (2010), Topfer (2000) and Walused (2000), and Garvare and Isaksson (2001). According to the triple bottom line, the development of a company is related to its societal and environmental as well as economic performance, so it is a broader perspective than the single bottom line, which claims that the company rises based on its financial performance. Even though economic, environmental and societal aspects of sustainability are the consensus, in the literature the researchers are sceptical in their views, particularly of the financial benefits to a company in terms of profitability concerns while being sustainable (Steger et al. 2007; Liyanage 2007).

James (2001) mentions three central pillars of sustainable development:

- **Economic development:** developing the wealth of all of society in ways that are compatible with other pillars.
- **Environmental protection:** avoiding adverse impacts on nature and social systems from pollution and other environmental problems.
- **Social inclusion:** bringing equalities of wealth, health and life chances to society.

3.1.b Service economy

Stahel (2001) takes the discussion one step further and defines the crossing of two borderlines to a sustainable economy. The first borderline between the old societal drivers and the new one is between *protecting the environment* in the past and *innovation and competitiveness* in the future. Stahel argues that the new drivers are *money*, *technology* and *competitiveness* rather than saving the environment. Hence, on the supply side, the managers' strategic priority has become 'doing the right thing' rather than 'doing things right'.

Crossing the second borderline from a sustainable economy to a sustainable society calls on sustainable consumption and sufficiency solutions. Stahel defines sufficiency as 'wants' and 'wishes' of people, the behaviours and attitudes of individuals, and the values of society through changes to 'social and cultural ecology'. He argues that the driver must be people's desire for sustainability – something that is still lacking.

In this sense, the service economy is the joint at which sustainable production and sustainable consumption meet and on which this thesis is built.

3.1.c New value emergence

Verna (2000), Vargo and Lusch (2004), and Grönroos (2006) highlight new value perception and creation, a rapidly developing service economy, dynamic requirements and expectations of stakeholders that influence and enforce the change in traditional relations with stakeholders, which have been based on tangible resources, and the embedded value in the product and transactions so far. Porter and Kramer (2011) argue that this change calls for common actions and mutually created and shared value. Carlsson-Kanyama et al. (2008) emphasize the need for platforms on which the stakeholders co-operate. Moreover, Grönroos (2006) highlights interaction and innovation as essential to surviving in the market.

For all these to happen, a better understanding of the evolving concepts is required. For this, co-development is proposed by Matthing et al. (2004) to gain mutual benefits for stakeholders through learning. Besides, a competitive market requires new ways to describe productivity and integrate business solutions in which stakeholders are actively involved in development and operation (Porter and Kramer 2011).

3.1.d Assessing sustainability

Delai and Takahashi (2011) point to immature sustainability measures in companies in relation to external pressure to document their sustainability performance while they face challenges of what and how to assess them due to the lack of consensus on sustainability measures. Bhattacharya et al. (2011) call for the steps at the companies, which share corporate responsibility, to be more sustainable: choosing related core business objectives to corporate responsibility, setting targets involving stakeholders and assessing performance by setting performance measures, to follow up their corporate responsibility performance as part of sustainability.

Labuschagne et al. (2005) develop a framework for sustainability criteria, considering the operational practices of the manufacturing industry in order to assess the sustainability of projects, technologies and the overall company. However, the developed framework and criteria used are in favour of and limited to the process industry.

Liyanage et al. (2009) address the complexity and multi-faceted nature (covers topics from habitat conservation to energy consumption to stakeholder satisfaction and financial results) of sustainability in order to express sustainability performance measurement requirements extending beyond the boundaries of a single company and the need to address the performance of both upstream and downstream customers in the value chain.

Baldwin (2009) counts the benefits of sustainable practices as lower production costs, improved product function and quality, increased market share, improved environmental performance, improved relationships with stakeholders and reduced risk.

3.1.e Sustainable consumption and consumers

Seyfang (2007) reasons the rise of sustainable consumption as an environmental policy in order to achieve more sustainable development. The author points the increasing focus on smaller-scale governance and citizen action, from local government to small groups and individuals. Growth in food purchases from outlets such as farmers' markets, box and food link schemes, farm shops influence the interest in local foods and sustainable food chains. Ilbery & Maye (2005) point the importance of consumers, as attention shifts away from price, packaging and appearance and towards obtaining food products that can be traced to particular people and places.

Närhinen et al. (1999) investigate the role of supermarkets in health issues in the Finnish society as an initial study for sustainability: They point the need for good co-operation between food control and supermarkets in order to be effective for change in consumers' shopping behaviour. Roininen et al. (2006) state Finnish consumers have had interest in the origin of foods and the production method recently. They investigate the associations in consumers' minds regarding local food with two different techniques: word association and laddering. Mäkipeska & Sihvonen (2010) count a number of changes in Finnish consumers as effective drivers for sustainable consumption. Those are increased awareness about environment, higher education and income, consciousness about cleaner production, higher quality and lower environmental effect.

3.2 Local food

3.2.a Definition and perception

K. Vasileiou and Morris (2006), Ilbery and Maye (2006), and Dunne et al. (2010) agree on the dependent definition and perception of local food among stakeholders in the food supply chain.

K. Vasileiou and Morris (2006) present the perceptions of potato growers, merchants and retailers of three dimensions of sustainability: economic, environmental and social factors in a case study in the UK. According to their analysis, growers give higher importance to market requirements and supply chain relations in 2000 than in 1990. For merchants and retailers, food quality and safety aspects have gained in importance, as has management of environmental risk, during the same decade. They argue that they can confirm the relevance of sustainability criteria to measuring supply chain performance; however, the need to involve consumers in the potato supply chain is obvious for a thorough sustainability assessment. Finally, they address joint action to reduce variability and risk in the supply chain as the performance of the potato supply chain and the partners within it is constrained by variability in the quantity, quality and price of potatoes. Furthermore, relationships and influence on individuals and organizations in the supply chain are perceived as critical to the performance of the potato supply chain.

Ilbery and Maye (2006) investigate the way the local food supply chains work from a retailer perspective in the UK. The authors interviewed five different types of retailers (farm shops, butchers, caterers, and specialist shops, supermarkets/department stores) to learn how they source local food and about their relationships with their suppliers. Most of the retailers support local food routes into the retailer market due to increased customer demand. Supermarkets, in particular, address local food in response to public criticism in parallel with customer demand. Moreover, they distinguish local and locality food as follows: local food refers to products produced and consumed within a certain distance or the same county, while locality food refers to products from further afield but with an identifiable geographical provenance. Finally, they address the need for research into customer perceptions of local food and its impact on rural-urban interactions.

Dunne et al. (2010) examine in detail 'what local means' among food retailers in Oregon and present significant differences in views on 'local' even among food retailers. They use a variety of unidirectional distances, geographic regions, personal connections and political boundaries when they determine what is local. Their motivation for 'local' is mainly that it supports the local economy. Some retailers indicate better product quality and increased demand for local food. Local food on the shelf is basically labelled 'local' (87.5 % of the interviewed retailers). Sixteen indicate the political place of origin, two of the retailers indicate the region of origin and two the farm of origin. Ownership and practices at the farms, photos of the farmer and a map of the geographic region are examples used for labelling.

SAC (2007) indicates that the producer/seller relationship is central to the local food concept. Consumers expect their local food to be produced a short distance from the retailers at which they buy them. This means that there is only a single or maximum middle stage relationship between the producer and consumers.

Rozelle (2010) proposes marketing local food as a profitable way for businesses to bring local producers and the public together beyond showing their commitment to local producers. Harvest dinners, farmers' markets and late summer festivals are some of the ideas the author proposes for local food marketing.

3.2.b Similarity with organic food

Bourlakis and Weightman (2004) count the factors influencing the organic food market in Europe as demand (driven by issues associated with general health and wellbeing), price (the biggest barrier to future expansion of demand), quality (consumers demand equivalent or better sensory quality for organic foods compared with conventionally produced food), availability (the range of products available and the continuity of supply both affect demand), state of the economy (in times of recession or difficult economic situations, e.g. high unemployment, growth in organic demand and the expansion of organic production have been shown to slow down with less spending on luxury items), creditability or organic standards, and auditing systems (the creditability of the organic industry and consumers' perception of the standards, sector bodies and certification agencies, in general, affect demand).

3.2.c Sustainability assessment of local food

Sundkvist et al. (2001) assess and compare the environmental consequences of local small-scale versus centralized large-scale bread production and potential self-sufficient bread production on Gotland. Bread production on Gotland results in higher energy consumption, but the recent increase in electricity production from wind power may provide alternative energy sources for the bakeries and local mills on the island. For self-sufficiency in local production and consumption, the current system of exporting unprocessed foodstuffs and importing processed products should be replaced by a system in which production and consumption are local and the surplus production is exported.

Vasileiou (2002) attempts to develop and apply a framework to assess the sustainability of supply chains for the fresh potato industry in the UK in his PhD thesis. A well-constructed literature review is presented on drivers-pressures-state-impacts-response (DPSIR), life cycle assessment (LCA), sustainable development records, the theory of planned behaviour and conjoint analysis, which are supposed to empower the developed framework. The leading report and results give a picture of ten years of change in the fresh potato industry in the UK within the grower-merchant-retailer frame instead of a sustainability assessment framework. According to his conclusion, following the proposed approach, the sustainability of the fresh potato supply chain could be measured over time by comparing the results with previous ones.

Ilbery and Maye (2005) investigate whether local or alternative food supply systems really are sustainable. They assess the economic, environmental and social sustainability of six speciality food supply chains on the Scottish/English border using SUSTAIN's sustainable food criteria (proximate, healthy, fairly/cooperatively traded, local employment, environmentally beneficial, accessible, high animal welfare, socially inclusive, knowledge/understanding of food culture). They conclude that the examined speciality food SCs are driven mainly by the economic imperative. They therefore accommodate many features of conventional supply chains. Hence, the emergence of hybrid food systems is mentioned instead of two separate groups: conventional and alternative.

Food sustainability and case study businesses

	Organic hill meat	Cheese/ice cream	Berwick honey	Galashiels bakery	Craster kippers	Borders shellfish
Proximate	√	×	×	×	×	×
Healthy	√	√	√	√	√	√
Fairly/cooperatively traded	√	√	×	×	×	×
Local employment	√	√	√	√	√	√
Environmentally beneficial	√	×	√	×	√	×
Accessible	×	×	×	×	×	×
High animal welfare	√	×	√	na	×	×
Socially inclusive	×	×	×	√	×	×
Knowledge/understanding of food culture	√	√	√	√	√	√
Total (out of 9)	7	4	5	4	4	3

Figure 2. SUSTAIN's nine food sustainability assessment criteria (Ilbery & Maye 2005)

Hamprecht et al. (2005) express the need to control the economic, environmental and social performance of food supply chains in order to satisfy the growing demand. They make a case study at Nestlé, one of the leading companies in the food and beverage industry, and highlight the importance of quality control along the whole supply chain for controlling sustainability.

3.2.d Alternative local food networks

Khan (2010) examines non-profit, urban green produce initiatives in London and gives examples of how they contribute to social justice and the environment, as they claim. Khan's examination shows that food initiatives are oriented towards local food due to the need for basic food access rather than sustainability concerns. Khan highlights that coops are set up in regions where there is lack of fresh green produce provision, after a needs assessment, whereas sustainable food initiatives do not consider this. Another argument is the challenge for sustainable food initiatives to satisfy the food preferences of the ethnic and radical groups they serve. High quality at a comparable price; low price for comparable quality; unique, seasonal, regional, ethical produce; an interactive and friendly shopping environment; activities linked to justice and human rights; and a contribution to easy food access are the essential characteristics of the AFNs.

Sonnino and Marsden (2006) analyse vertical and horizontal embeddedness of alternative food networks in South West London. They claim that alternative food networks have emerged through developed relationships with stakeholders who share the same values and goals. AFNs have identical characteristics, mainly agreed by their members. They aim to survive and develop local producers' mobility area in the market while protecting their local being. Three alternative food networks are presented in their study: Cornish clotted cream, Steve Turton meats and West Country Farmhouse Cheddar Cheese. They note that vertically, political actions are needed to support the embeddedness of alternative food networks in the traditional market, and local producers need a more reliable market with re-constructed demand management. Horizontally, even though corporate retailers in South West London have begun to see the benefits of meeting customers' regional and local food demands, it is still a challenge for local producers to overcome intra-sectorial competition. Hence, participation in AFNs brings significant value added gains for local producers in terms of income and revenue. Quality, uniqueness, safety and traceability are the essential food characteristics in the three AFNs presented.

Mikkola (2009) explores how public caterers use their position and productive intelligence to promote a sustainable food system within the power field of their contextual networks in Finland. Caterers' concerns regarding sustainability are presented as a procurement of domestic, local and organic food, Fair Trade products and waste management, besides conservation of energy and water.

Hybrid food systems and spaces are introduced by Ilbery and Maye (2005) rather than two separate oppositions as 'conventional' and 'alternative'. With respect to their investigation of the speciality of businesses on the English/Scottish borders, they conclude that speciality

food businesses that have characteristics of hybrid food systems are not necessarily more sustainable.

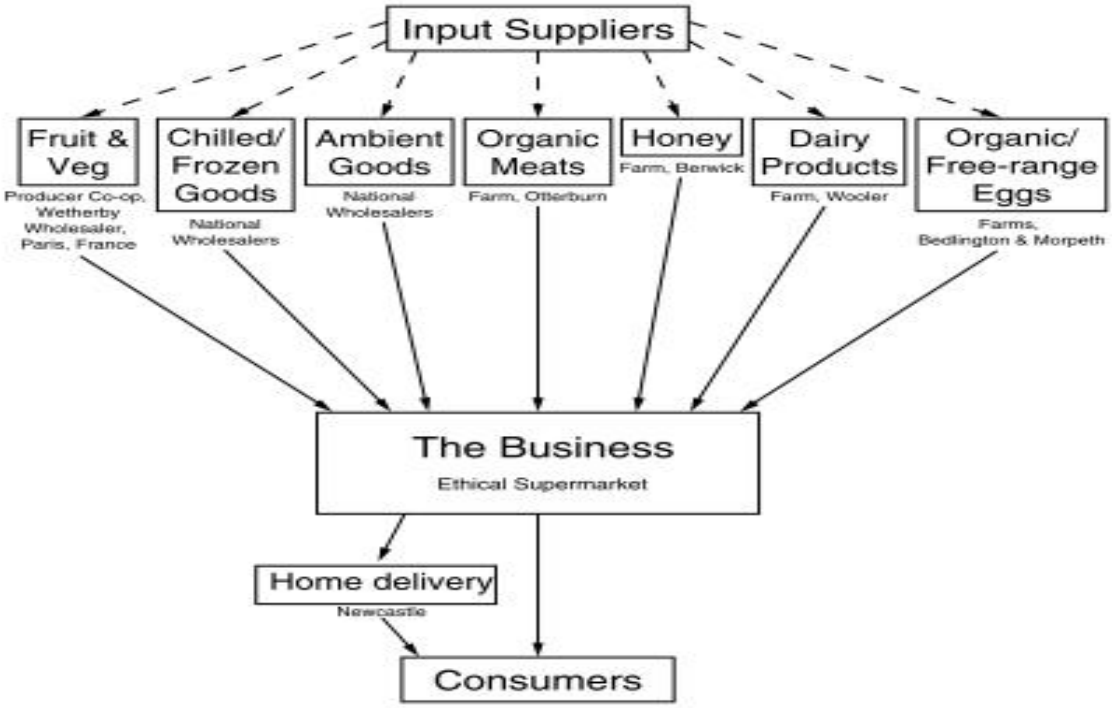


Figure 3. Supply chain of an ethical supermarket (Ilbery & Maye 2006)

3.3 Retailing and supermarkets

3.3.a Definition and emergence of new stores

According to Bourlakis and Weightman (2004), retailing is the stage of the chain at which firms interact with the final consumers and customers. Communication with the final consumers through a store network and marketing initiatives is the main issue for retailers, as the market is large and spatially disaggregated.

The authors argue that there has been an on-going transition in the sector since the 1980s, referring to three major innovations in the structure of the sector: adoption of self-service, acceptance of marketing as the dominant business paradigm, convergence of information and communication technologies (ICT).

Self-service in retailing gave customers' direct access to products, the possibility of larger stores – supermarkets – and employees very different functions to perform. The acceptance of marketing resulted in alternative designs to suit the needs of the specific types of consumers and consumer demands. The targeted store formats are the results of advanced ICT systems, with the emergence of superstores, convenience stores, limited range discount stores, etc., all operated to satisfy a specific, rather than general, aspect of demand. The convergence of ICT presently enables successful management of very large networks of stores.

Jones et al. (2005) indicate that with their increasing range of goods and services for consumers, large retailers, with their aggressive strategies to increase sales, profits and markets, have become the dominant power in the retailing market.

3.3.b Supermarket in sustainable food retailing

"As gatekeepers of the food system, supermarkets are in a powerful position to create a greener, healthier, fairer food system through their influence on supply chains, consumer behaviour and their own operations." (SDC 2008)

Jones et al. (2005) conclude that the majority of companies have broadly similar environmental programmes, typically involving energy efficiency, water consumption, carbon dioxide emissions, vehicle emissions, reductions in the volume and constituents of packaging, waste management and recycling. Furthermore, large retailers address social issues in their sustainability agendas, including social inclusion, ethical trading, healthy living, training, health and safety, and community support initiatives. However, their strategy of handling the economic sustainability issue varies; for instance, some see it in terms of securing lasting and profitable growth while others see it as economic regeneration and support for local economies.

Ilbery and Maye (2005) state that the development of speciality and niche market food products on their own does not reconnect producers and consumers. It is highly unlikely to succeed unless there is sufficient demand and well-connected entrepreneurs, even if they produce a local/organic 'quality' product. Local food suppliers therefore seek stable alternatives like supermarkets.

3.4 Service development

Alam and Perry (2002) present ten stages of customer-oriented new service development. These are the results of their investigation into 12 purposefully selected companies that perform in the financial services industry, as shown in Figure 4.

Matthyssens and Vandenbempt (1998) express the need to have discussions with customers during new service development.

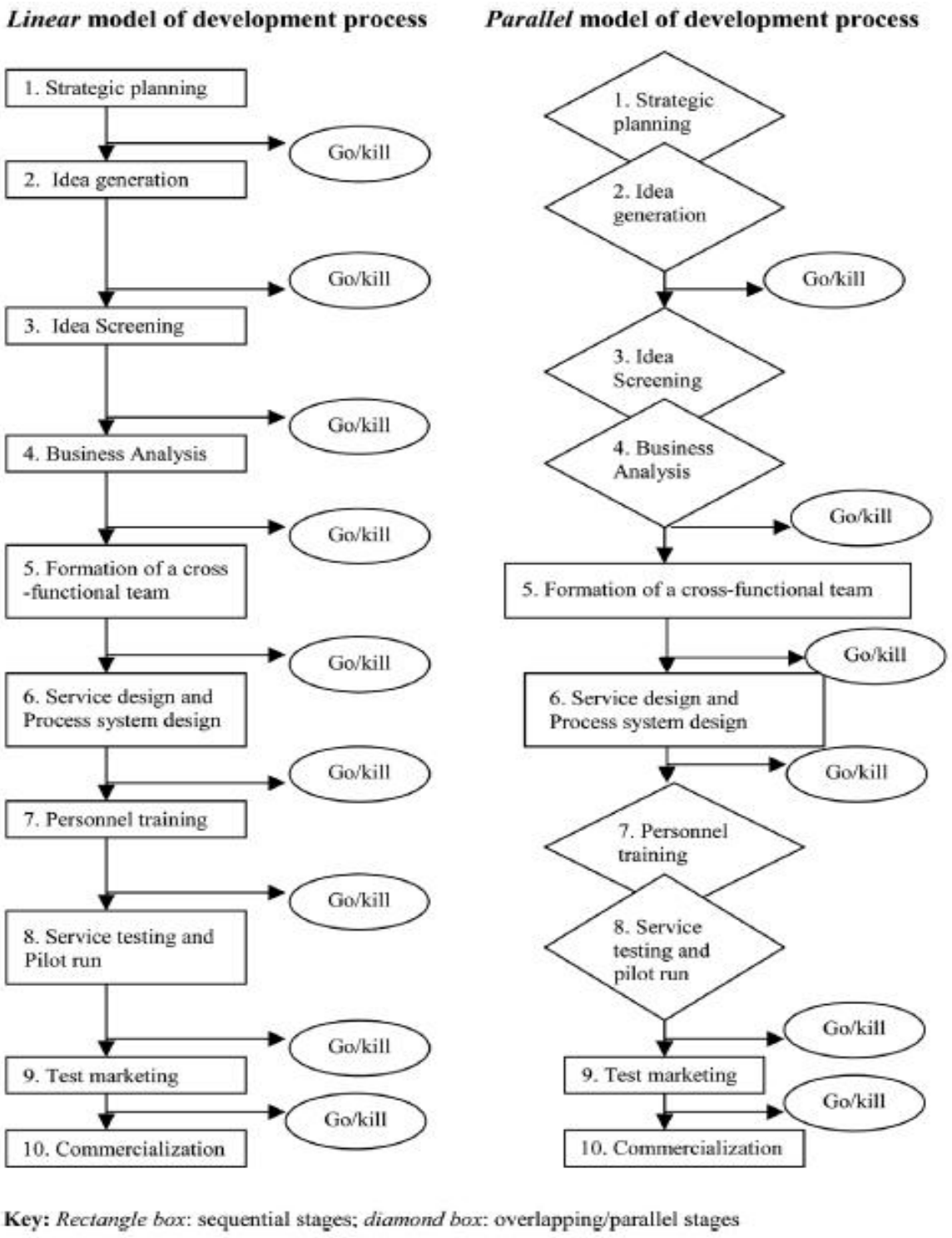


Figure 4. Two models of new service development (Alam & Perry 2002)

3.5 Co-development

Kaasinen et al. (2011) introduce the Open Web Lab, Ihme innovation showroom and living labs as approaches to involve users in service design. They declare users co-designers and content creators together with service designers in response to advanced technology development and difficulty capturing all needs during the design without user experience.

Anderson and Crocca (1993)'s co-development definition in Matthing et al. (2004) stated that *when a company, together with its customer users, evaluates a new technology together with established work practice. Direct collaboration around the use of technology in actual work settings enlarges and enriches the work practice of both parties.*

Anderson and Crocca's definition is relevant to the thesis in terms of evaluating local food service sustainability performance together with stakeholders of the hypermarket and creating direct collaboration platforms through that study.

3.6 Systems engineering process

DOD (2001) describes the systems engineering process as a top-down comprehensive, iterative and recursive problem-solving process applied sequentially through all stages of development. It is used to transform the needs and requirements into a set of system product and process descriptions, generate information for decision-makers and provide input for the next level of development. Figure 5 shows the fundamental steps of the systems engineering process. They are requirements analysis, functional analysis, and allocation and design synthesis. System analysis and control are used to track decisions and requirements and verify that the requirements are met.

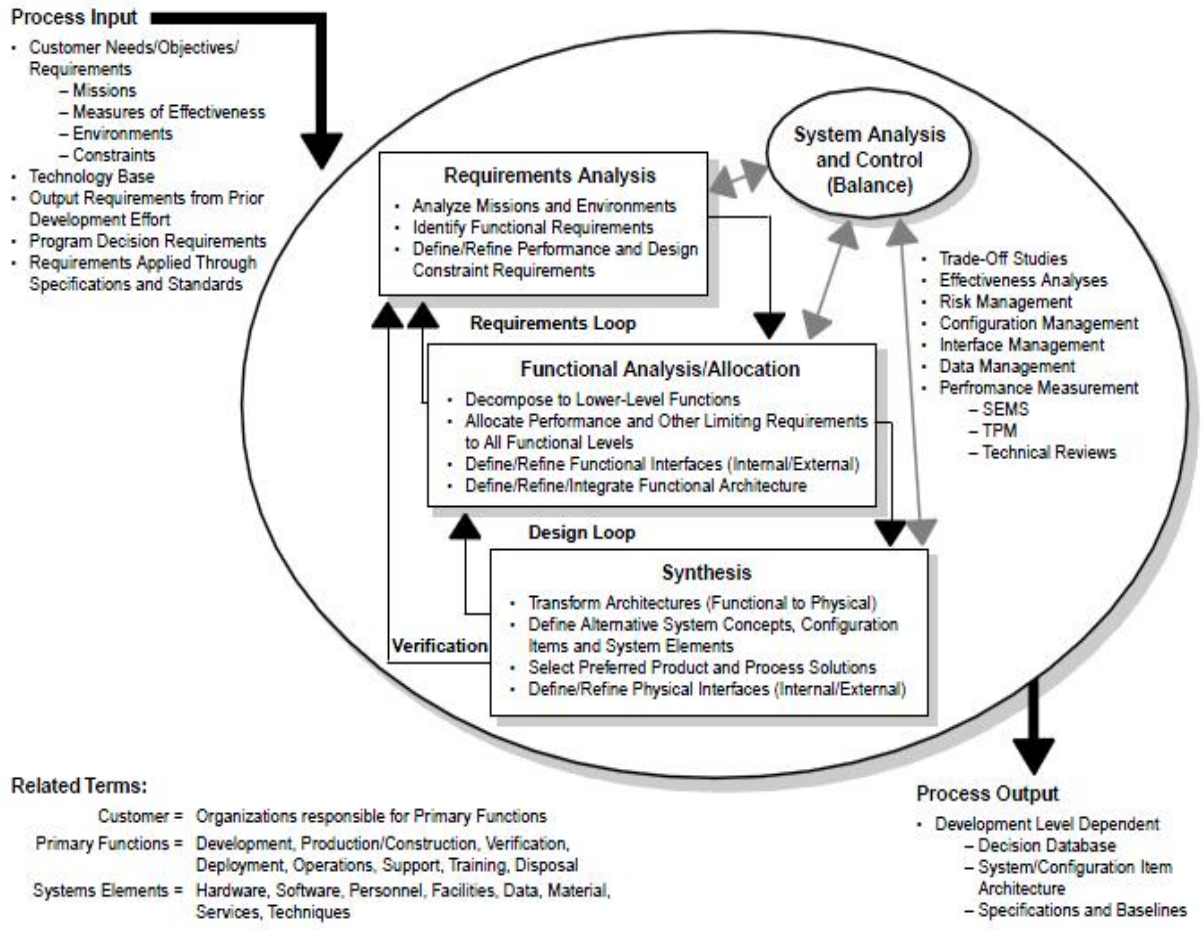


Figure 5. The systems engineering process (DOD 2001)

The word ‘architecture’ is used as an indication of how the subsystems join together to form the system. Hence, the Functional Architecture identifies and structures the allocated functional and performance requirements. The Physical Architecture depicts the system product by showing how it is broken down into subsystems and components. The System Architecture identifies all the processes necessary for development, production/construction, deployment, operations, support, disposal, training and verification.

Functions are generated based on the requirements, and the components perform functions. The items are inputs, outputs or triggers for functions, as shown in Figure 6. (For more details, refers to the systems engineering guided tour, Vitech 2011.)

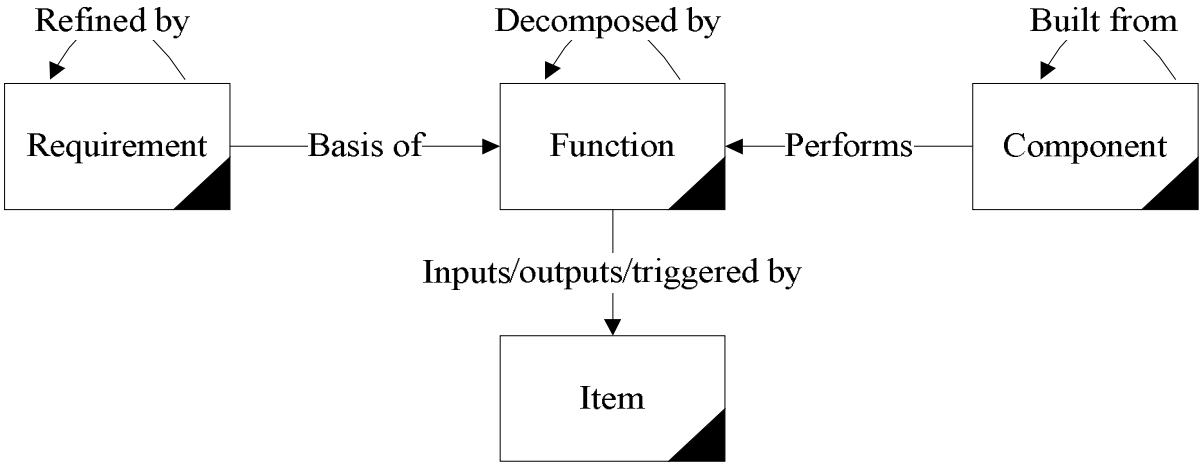


Figure 6. Primary systems engineering elements

Integration Definition for Function Modelling (IDEF0) is a common modelling technique for the analysis, development, re-engineering and integration of information systems, business processes and software engineering analysis.

The two primary modelling components are functions (represented by boxes), and data and objects that interrelate those functions (represented by arrows). The position at which the arrow attaches to a box conveys the specific role of the interface. The controls enter the top of the box. The inputs, data or objects acted on by the operation, enter the box from the left. The outputs of the operation leave the right-hand side of the box. Mechanism arrows that provide supporting means for performing the function join (point up to) the bottom of the box, as shown in Figure 7.

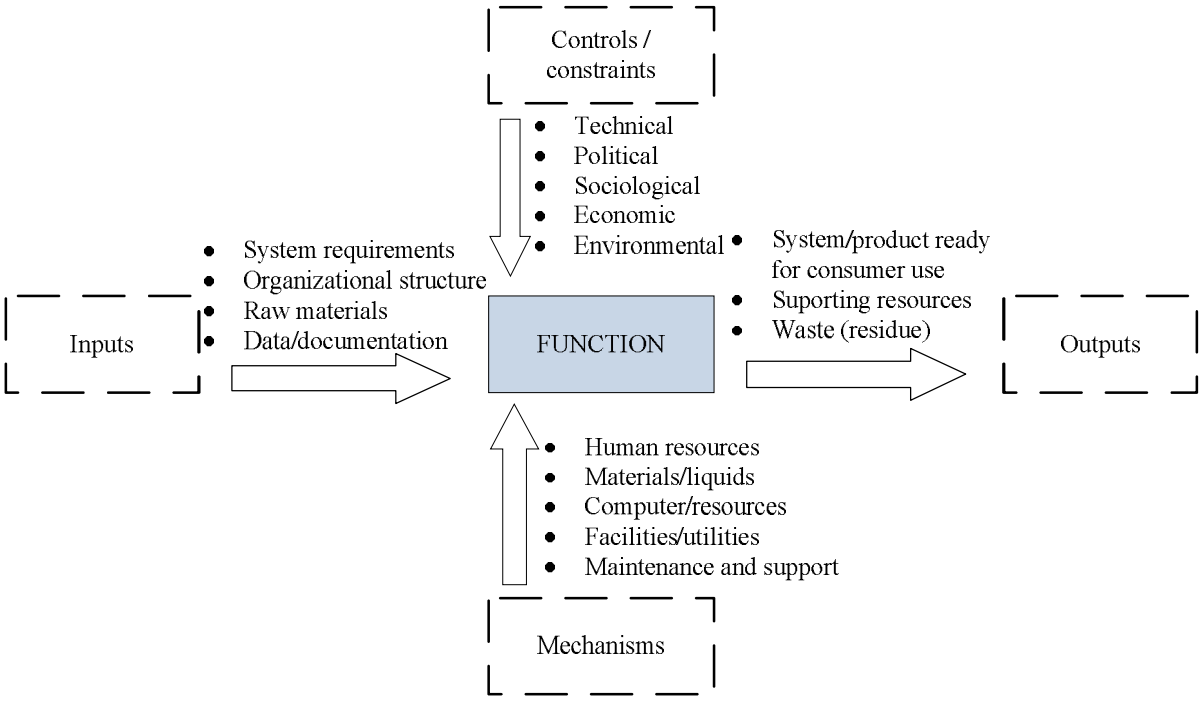


Figure 7. Integration definition for function modelling (IDEF0) (Blanchard & Fabrycky 2011)

3.7 System simulation

Banks et al. (2005) describe simulation as the conceptualization of a real system running over time. A simulation model is constructed on some logical, mathematical and symbolic relationships between entities and operations of the system, and it is a cost-effective tool to see the characteristics of a designed system. It provides the chance to see the impact of changes on the system without physically building or disturbing the existing system. Simulation is a helpful tool for verification with the advantages of (ibid):

- analysing new decisions, processes and their effectiveness without real system operations
- the chance to check and analyse *how* and *why* questions
- providing an understanding of relations between variables
- visualizing the influence of variables on system performance

Simulation has a wide application area, and various types of simulation software are available for users. Vensim is one of these, and the one I have used in the analysis part. It is used for developing, analysing and packaging high-quality dynamic feedback models (Ventana 2012). Its features include mainly dynamic functions, arrays, Monte Carlo sensitivity analysis, optimization, data handling and application interfaces. Models are constructed graphically or in a text editor. The model elements used are shown below, as presented by Ventana (2005), Shiflet and Shiflet (2011) also shown in Figure 8.

Box variable or **stock** is a noun that represents something that accumulates, for instance, population or money.

Rate or **flow** is a verb and an activity that changes the magnitude of a box variable, for instance, births in a population or growth of money.

Auxiliary variable or **constant (converter)** modifies an activity. A variable that can store an equation or a constant. For example, with the population model, a variable may store the constant growth rate, say 10 % = 0.1.

Arrow or **connector** transmits an input or output. For example, in a population model, an arrow can transmit the growth rate value from the growth rate constant (converter) to the growth flow.

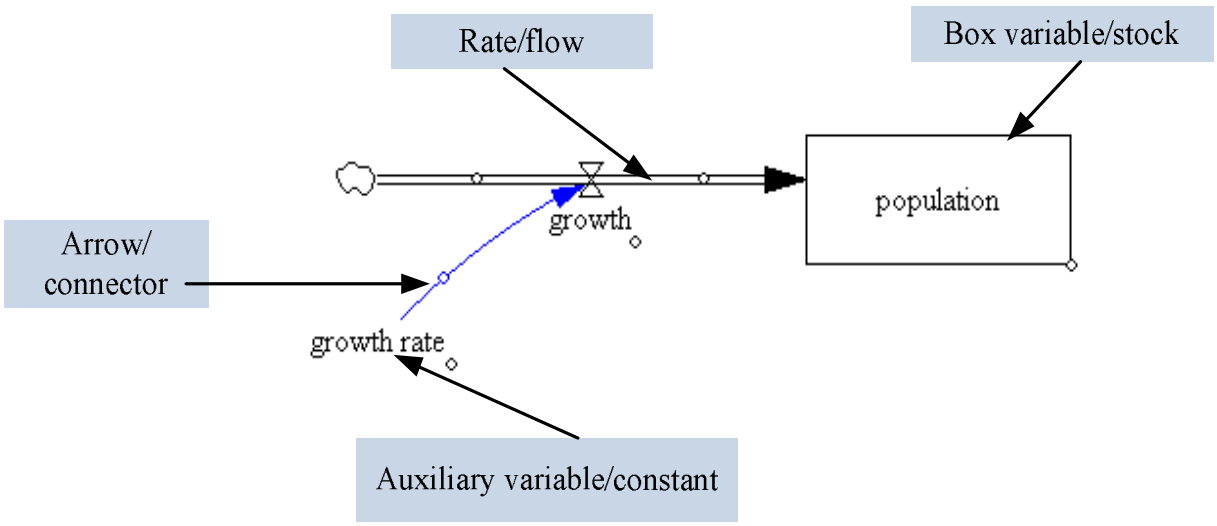


Figure 8. Vensim PLE model elements

4. MODEL

The SELF development model has emerged due to the lack of a local food service development model/framework/roadmap in the literature. However, it has been built on the findings in the literature, which point out different needs for a sustainable food system/food supply chain/food retailer. The findings are combined with the logic of the systems engineering process. Figure 9 presents the developed model.

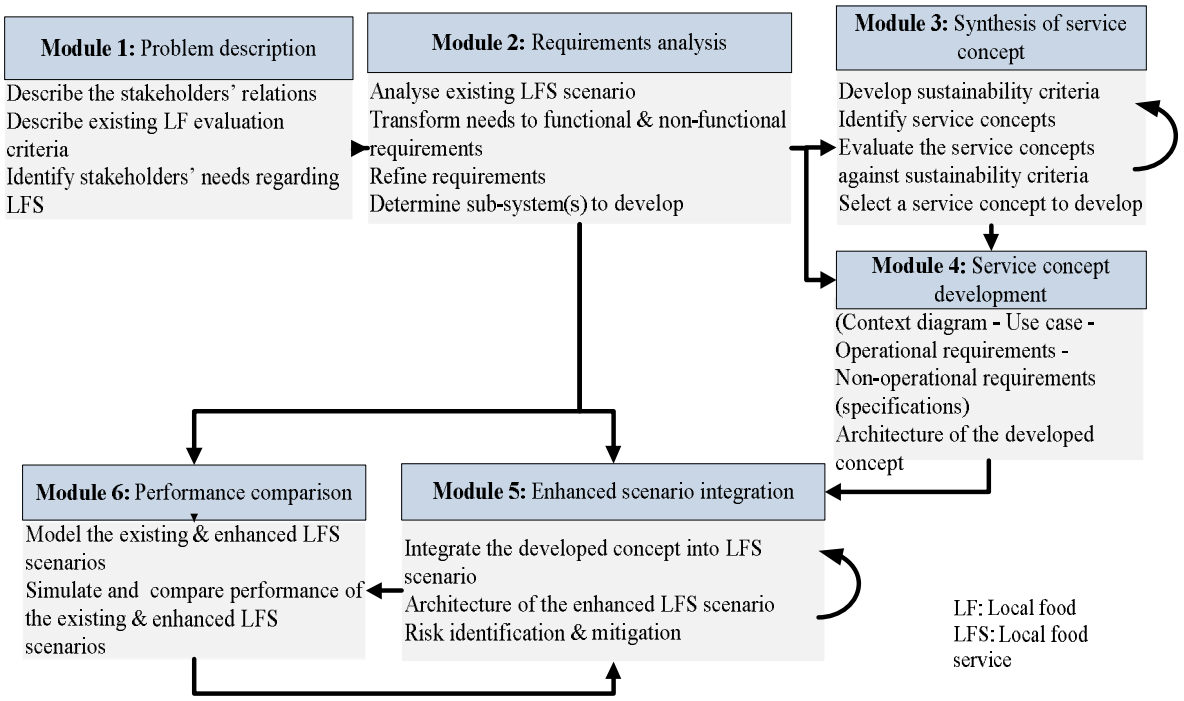


Figure 9. Sustainability-enhanced local food (SELF) development model

Module 1: Description of problem

Sustainable development requires production and consumption to be considered together. From this perspective, Ilbery andMaye (2006) point out the importance of relationships and influential stakeholders in the food supply chain. Co-development is an attempt to strengthen these relationships. Roininen et al. (2006) state that customers also need to be involved in the FSC sustainability assessment. On this point, *describing stakeholders' relations* and examining *existing LF evaluation criteria* are the two steps in the module that tell us the existing status of the LFS. Khan (2010) discusses assessing the needs of citizens when developing AFNs. *Identifying stakeholders' needs regarding LFS* is intended to involve consumers as well as suppliers in the LFS development process for a hypermarket. The SELF development model proposes co-development with all stakeholders rather than involving only consumers in the development.

Module 2: Requirements analysis

Vasileiou (2002) presents factors that influence decisions by farmers, merchants and retailers that have been useful in understanding the stakeholders' priorities regarding sustainability. *Analysing existing LFS scenarios, transforming collected needs for functional and non-*

functional requirements and *refining requirements* are the steps in the module towards a good understanding of the stakeholders' perspective and the existing LFS functions. Lastly, the *subsystem needs to be determined* in order to develop it further in future modules.

Module 3: Synthesis of service concept

Ilbery and Maye (2005)'s sustainability assessment is based on their re-reading of examined cases and interpretation of answers that are collected by interviewing producers. They use 'SUSTAIN' criteria to evaluate the sustainability of FSCs on the English-Scottish border. The authors state that SUSTAIN's criteria are open to various interpretations, but they provide a framework for analysis and a tool for critique for the study. In this module, *developing sustainability criteria, identifying service concepts* based on the determined subsystem in module 2 and *evaluating those service concepts against sustainability criteria* allow us to *select a service concept to develop*. The developed sustainability criteria, identified service concepts and selection process are validated with the shopkeeper before going into detailed development. Validation is shown by an arrow leaving and arriving in module 3 in Figure 9.

Module 4: Service concept development

Sundkvist et al. (2001) mention possible mutual benefits for the stakeholders in the case of investing in energy-efficient technologies in the bread production case on Gotland. Hence, it is valuable to analyse the context of the case and extract co-development options. Khan (2010) points to the same need, emphasizing the importance of the context, i.e. geographical characteristics, consumer groups, supply options and competitors during sustainable FSC development. Within the *service concept requirements, the context diagram, use case scenarios, operational* and *non-operational requirements* (specifications) *are defined*. The context diagram shows the system of interest (SoI) and its active and passive stakeholders in the context. The use case scenarios help to show the interactions between the SoI and user, operator, etc. The operational requirements regard actions that the SoI should perform. Specifications regard system effectiveness and the life cycle cost, as listed in the details in 6.3.a. The architecture of the SoI is completed considering these requirements.

Module 5: Enhanced scenario integration

The architecture of the developed service concept is *integrated into the LFS scenario,* and *the enhanced LFS scenario architecture* is presented. Possible *risks are identified and mitigated*. The outcomes are validated with the shopkeeper (shown by an arrow leaving and arriving in module 5) in Figure 9. The need for a pre-test and verification of the development process is emphasized.

Module 6: Performance comparison

Existing and enhanced LFS scenarios are modelled via simulation; hence the functions and all the interfaces with entities are verified. The performances of both scenarios are tested and compared against the sustainability performance indicators. The results show the specific enhancement aspects of the LFS scenario.

5. EMPIRICAL FINDINGS

The empirical findings in this thesis are gathered through a meeting and corresponding emails with the hypermarket shopkeeper. For the first meeting, the thesis author, accompanied by two researchers involved in the project, visited the hypermarket. The meeting took place on the 10th of April as a round-table discussion. The following information has emerged from the notes of the researchers.

5.1 Case description

The case hypermarket is the oldest subsidiary of the brand's chain in Finland. It is located in downtown Lahti. There are three more hypermarkets in the region, though the shopkeeper does not count them as competitors. He argues that they have different customer profiles that present different shopping behaviours. They compete with the one located directly opposite the case hypermarket, the biggest subsidiary of another large hypermarket chain in Finland, which was opened only a few months ago.

The hypermarket has 60 employees in total, 20 of which are responsible for the food store. The cashiers and other personnel are employed by the hypermarket chain and the 20 by the shopkeeper. The costs are shared on a percentage basis.

Figure 10. Location of the case hypermarket and its region within 50-70-100 mile distances

Position of the case hypermarket in the market

The shopkeeper describes the difference between his hypermarket chain and the competitor's chain: it implements 60 % of the brand's concept in the hypermarket, with the remaining 40 % being free, while the competitor's chain is stricter about having the same concept in all the hypermarkets. This gives the shopkeeper the chance to take his own initiative, with certain limits, to differentiate the market. He says that the hypermarket has the freedom to make

independent changes while its competitor has to consider thousands of other subsidiaries of the brand when it plans a change or innovation. He says that being better and faster is a must to carry the leading flag.

He points to the hypermarket's identical characteristics as providing consumers with service for more than just products, such as having a service line for meat, fish and cooked food; a café; making customers feel comfortable in the shop; and creating a learning environment through shopping.

Shopkeeper profile and responsibilities

The shopkeeper of the hypermarket Marko was previously an HR director of another firm. He then worked as a shopkeeper of another subsidiary of the same brand for two years, and, finally, he has worked at this hypermarket for the last six months. The shopkeeper has a wide perspective on his business as has been in two locations directing the same business. He expresses the context difference between one location and the other. He has the same educational background as the researchers and has investigated local food for his business before. This helps both sides feel comfortable and have productive conversations as they are familiar with each other's way of thinking and understanding.

The area of responsibility of the shopkeeper is the food store within the hypermarket, which also sells a wide range of products to consumers beside food.

Product variety in the food store and supply

The products in the food store vary from milk, meat, drinks, canned and dry food, frozen products and cheese to vegetables. Vegetables are mostly supplied from the main brand's warehouse located in Vantaa. It has three to four local suppliers of bread, potatoes, onions, vegetables, fish and canned food. They also supply from wholesalers.

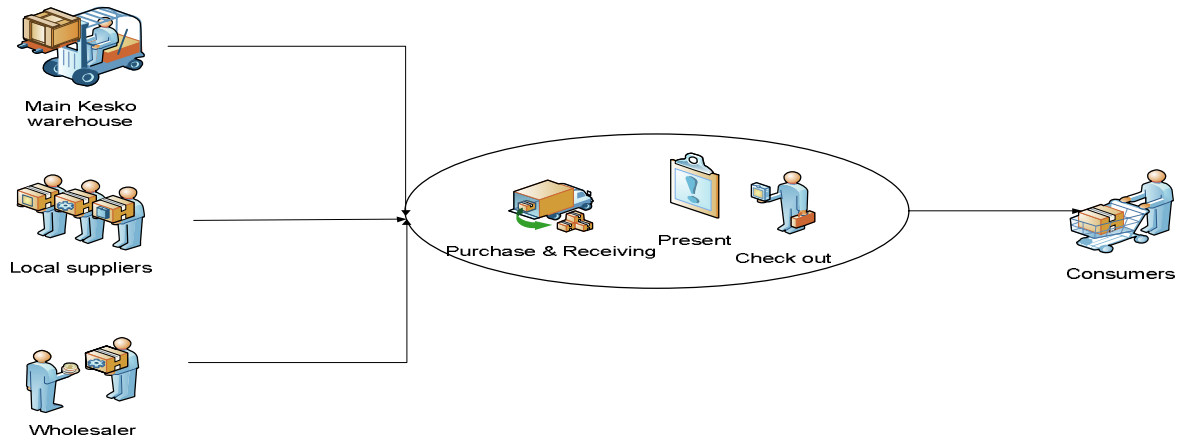


Figure 11. Current food flow from the supplier to the customers

Local food as a differentiation strategy

These concern local food and business with local producers as a diversification strategy in the market. Even though their competitor has recently had the same intention with regard to local

food, he claims that they have more mature experience of the area and try to live up to the name 'local food' with foods that *really* are produced or grown in the local region, unlike the others.

Current local food business

The food store personnel are responsible for finding local food suppliers. No systemic way is followed in advance. The shopkeeper also does some research but is mainly involved in the negotiation stage with local food suppliers. Even though they do not have specific, determined criteria for the local food supply, for instance, the quality and amount of ingredients are considered when the local bread suppliers are decided, they are also concerned with animal welfare and working conditions when they decide on suppliers for local meat, milk and fresh vegetables. When the main food sustainability criteria were introduced to the shopkeeper, he prioritized *traceability*, *quality* and, in some cases, *uniqueness* as essential to the hypermarket's offerings, as the customers valued them more.

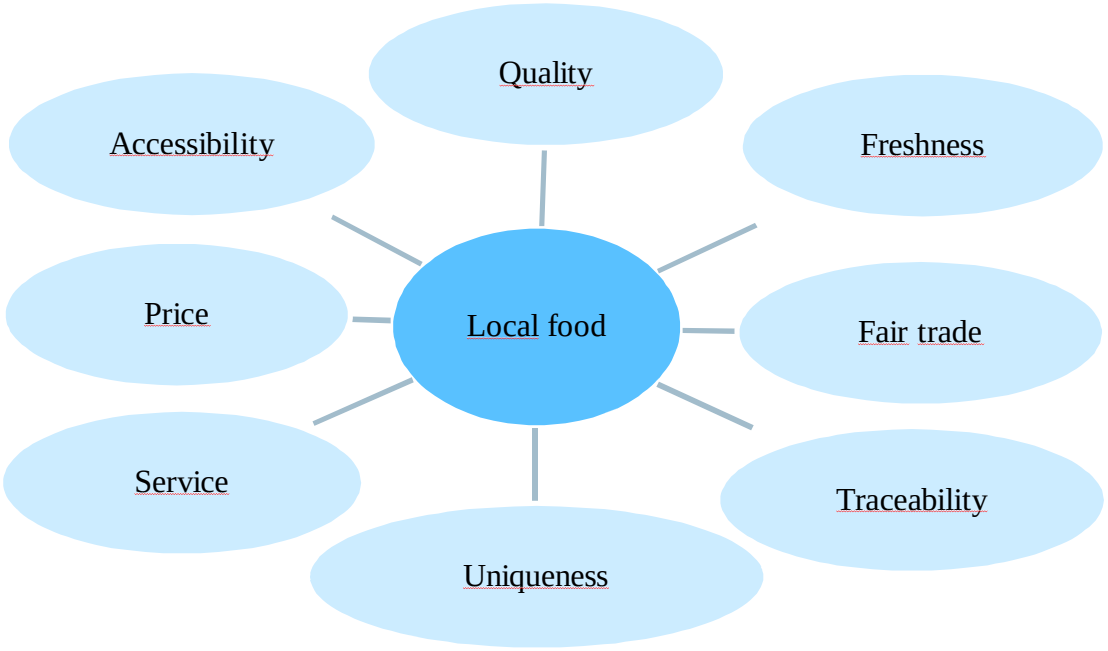


Figure 12. Local food and surrounding food sustainability criteria

Sustainability perspective

The shopkeeper addresses the fact that sustainability is not a current strategy for the hypermarket chain, though it is aware of its responsibility and was listed as one of the top ten responsible companies in the world in 2010. He continues, "*It is obvious there is a lot more to do, that's the reason why we want to co-develop with you to be more sustainable.*"

5.2 Module 1: Description of the problem

5.2.a Hypermarket-customer relationship

Currently, the hypermarket responds to about 90 % of customer requests when it receives them. It uses trial and error to respond to requests, and it does not thoroughly assess the need for the action or the performance of the action when it is done.

Point-of-sale data are acquired via customer cards for the brand, which are valid in all hypermarkets of the brand in the country. Detailed reports at different levels are collected in the central database. Even though the available data utility is limited for now, there are intentions to use it, i.e. send offering letters to specific customer groups according to their analysed shopping trends from the hypermarket.

From the sustainability perspective, the shopkeeper says that he is new to the context in Lahti so it is challenging for him to know how the customer feels about sustainable products; however, he points out increasing health and quality concerns for the general customer profile. The questions in his mind are still whether customers would be interested in seeing more local, sustainable products on the shelf, whether they would buy them and whether sustainability would add value to their service and more business.

Nonetheless, there is no organized communication channel to obtain customer feedback, suggestions and requests. Even if the hypermarkets obtain it somehow and improve their service, they do not know if the customer is aware of the improvement/change and they do not measure the satisfaction/dissatisfaction of their customers.

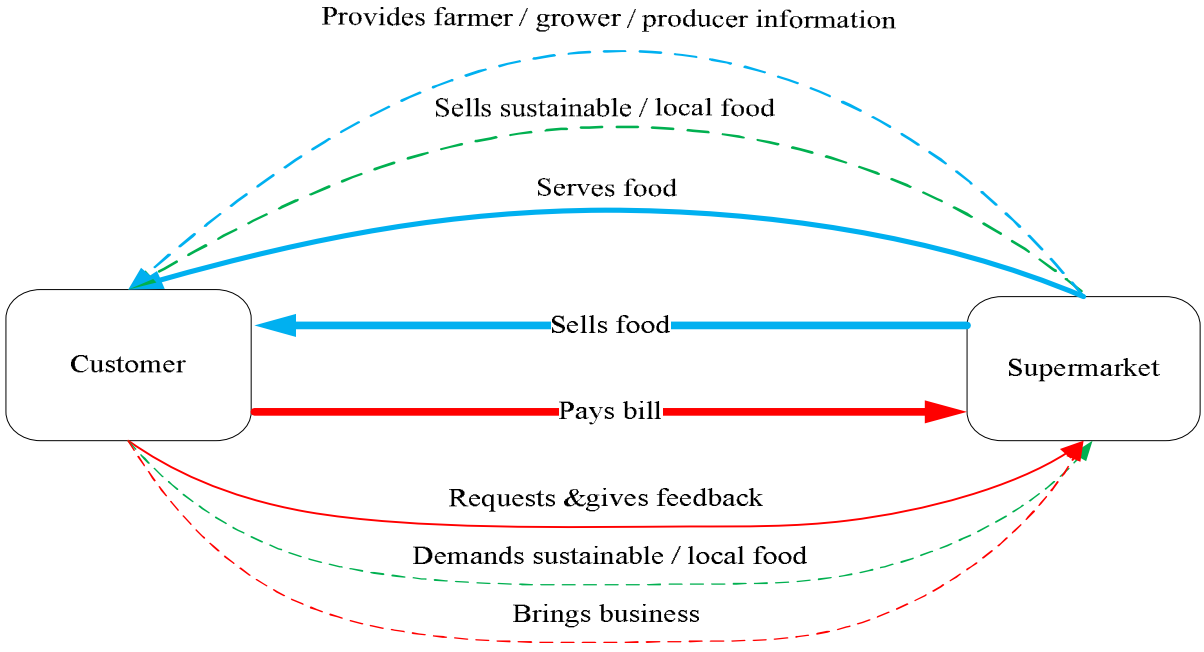


Figure 13. Hypermarket-customer relationship (thickness of arrows shows the current strength of the activities)

5.2.b Hypermarket-local supplier relationship

The shopkeeper started mentioning his experience of local suppliers in the previous hypermarket. He had invited local producers to sell their offerings in Lempäälä, and a group of local producers had done so. They had delivered their products to the hypermarket on a flexible schedule. They had decided themselves on the quantity of products and the frequency of visits. They were also responsible for the transportation of their goods. The shopkeeper said that these local suppliers were happy at the time. On the other hand, he observed that the local suppliers in the Lahti region were not willing to co-develop their business with the hypermarket because they perceived the hypermarket as a competitor. Attempts by the shopkeeper remained fruitless in this sense.

Nonetheless, the shopkeeper continues searching for alternative ways to attract local suppliers and involve them in his business. He firmly believes in the corresponding benefits of co-developing the business for the sake of strengthening the local economy.

A systemic way for a local supplier assessment process is needed. Thus, building sustainability criteria and integrating them into a developed assessment process would allow the shopkeeper to consider the sustainability of his operational activities, which have consisted of ad-hoc actions and trials in terms of sustainability so far.

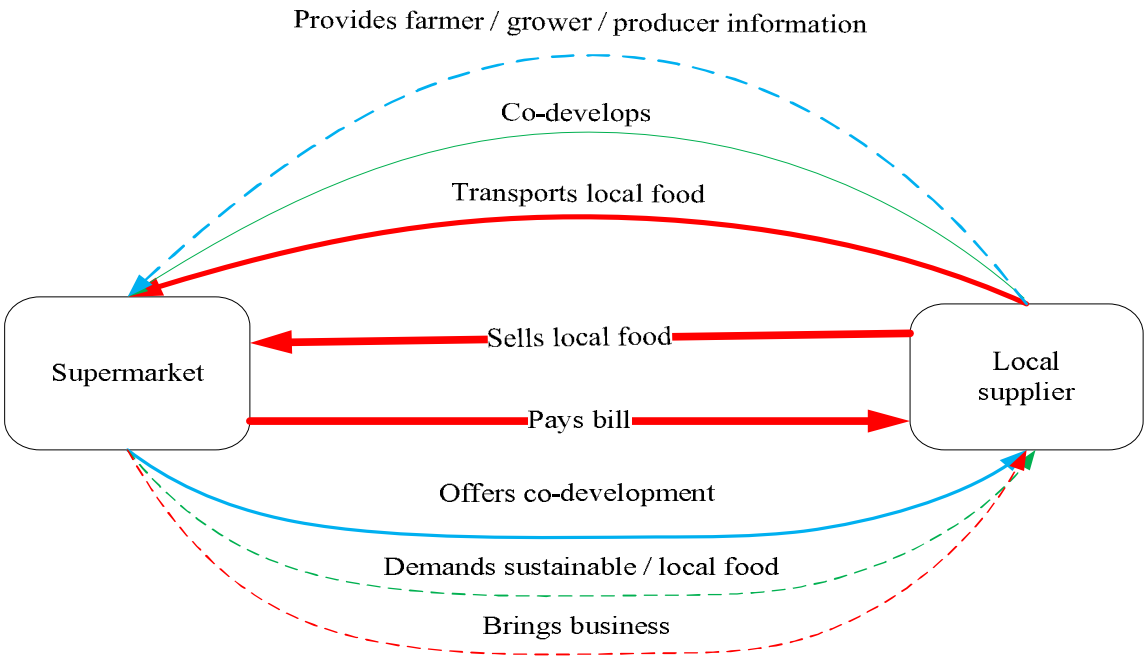


Figure 14. Hypermarket-local supplier relationship (thickness of arrows shows the current strength of the activities)

5.2.c Customer and stakeholder needs

The life cycle processes (LCP) of the LFS are defined. LCPs are given as the three main phases of the LFS from the producer to the consumers: supply, retail and shop.

Supply consists of 'growing, picking, packing and transporting vegetables' functions as the necessary activities to supply vegetables to the hypermarket. When these functions are

considered, the stakeholders involved in the supply process are ‘seed and plant suppliers; farmers; picking, packing and logistics workers; and agricultural regulators’.

Retail consists of ‘purchasing and receiving, presenting and checking out’ functions as necessary activities to retail vegetables to consumers. When these functions are considered, the stakeholders involved in the retail process are the ‘shopkeeper, purchasing and receiving department, food store employees, and cashier and retailing regulators’.

The shop consists of ‘reaching, selecting local vegetables and paying the bill’ functions as the necessary activities to shop. When these functions are considered, the stakeholders involved in the shop process are ‘consumers and recycling company/waste manager’.

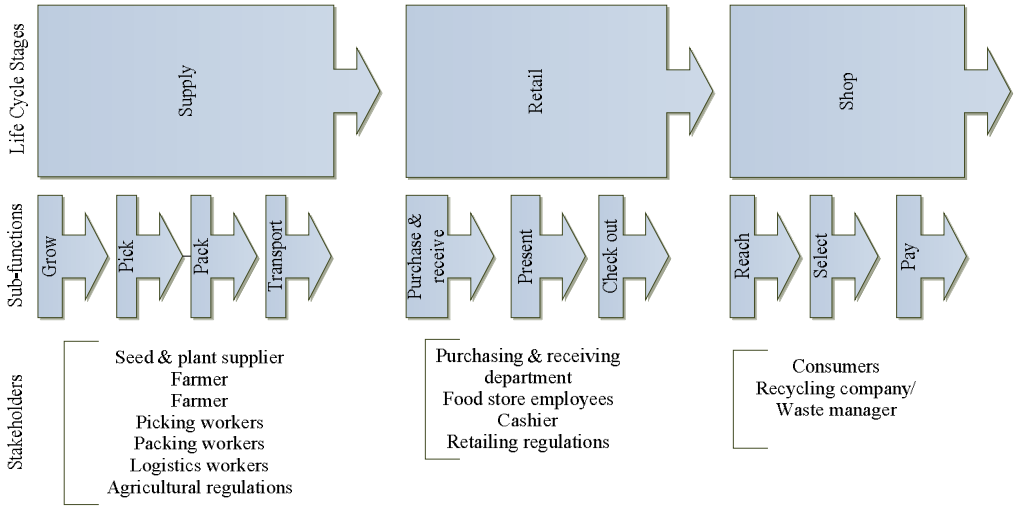


Figure 15. Life cycle phases of local food

The shopkeeper points out the needs regarding local food service as follows:

- The sustainability factors need to be defined and a sustainability index of offerings built up for use in decision making.
- A better understanding is needed of the offerings in the area, i.e. while hypermarkets know bakeries quite well they do not know what is available in the area when it comes to vegetables and more specialized foods like chocolate and berries.
- A list of potential local suppliers and their offerings is needed.
- The hypermarkets want to know what actions to take and which way to go when deciding on the products and bringing them to the shelf.
- The most important question for the hypermarkets is how to ensure that the customer will know about the product and that it will be sold.

These needs are the main drivers of the LFS development in this thesis, since the shopkeeper is the customer of the developed LFS. Moreover, the supplier and consumer needs are covered since they are the main stakeholders in the LFS. Regulations for food retailing are also considered.

Supplier needs:
They are afraid of losing their uniqueness if they supply to a hypermarket.
They lose contact with their own customers when they use a middle player for their sales.
They want support to survive and grow, not to be a part of a hypermarket's business.

Consumer needs:
They want high quality food.
They want to know where the vegetables come from.
They want their vegetables to be unique.
They are willing to pay more as long as they are informed about where their money goes.
Collected needs are transformed into requirements in 6.1.b.

5.2.d Local food criteria

The following criteria for local food are currently considered by the food store when it deals with local vegetable suppliers. The impact levels on three aspects of sustainability range from 1 to 3: lowest=1, medium=2 and highest=3.

- *Quality* is the first criteria on which there is consensus between all stakeholders. The freshness of the vegetables is part of the quality.
- *Traceability* refers to the origin of the vegetable desired by consumers, so that is considered by the hypermarket.
- *Uniqueness* is the main concern of local food suppliers. They want their products to be unique. Consumers are willing to pay more for unique products.
- *Price* must be reasonable.
- The hypermarket desires continuous and sufficient supply, which refers to *security of supply*.
- *Local production* is desirable. Vegetables supplied within … km of the Lahti region are considered local.
- *Seasonal availability* is important when the geographic and climate conditions of the region are taken into account.

6. ANALYSIS AND RESULTS

Modules 2-3-4-5 and 6 of the SELF development model are covered in this chapter. The local food service (LFS) scenario is the main system. The LFS scenario is broken down into its functions and sub-functions. Further analysis and development are carried out for a sub-function (presenting) of the retailing function. The developed presenting concept is integrated into the enhanced LFS scenario. Lastly, a performance comparison of existing and enhanced LFS scenarios is made and the results presented.

6.1 Module 2: Requirements analysis

6.1.a Analysis of the existing local food service (LFS) scenario

The existing LFS scenario consists of three main functions: *supply*, *retail* and *purchase*. Each function has a number of sub-functions that are necessary to successfully supply, retail and purchase, as shown in Figure 16.

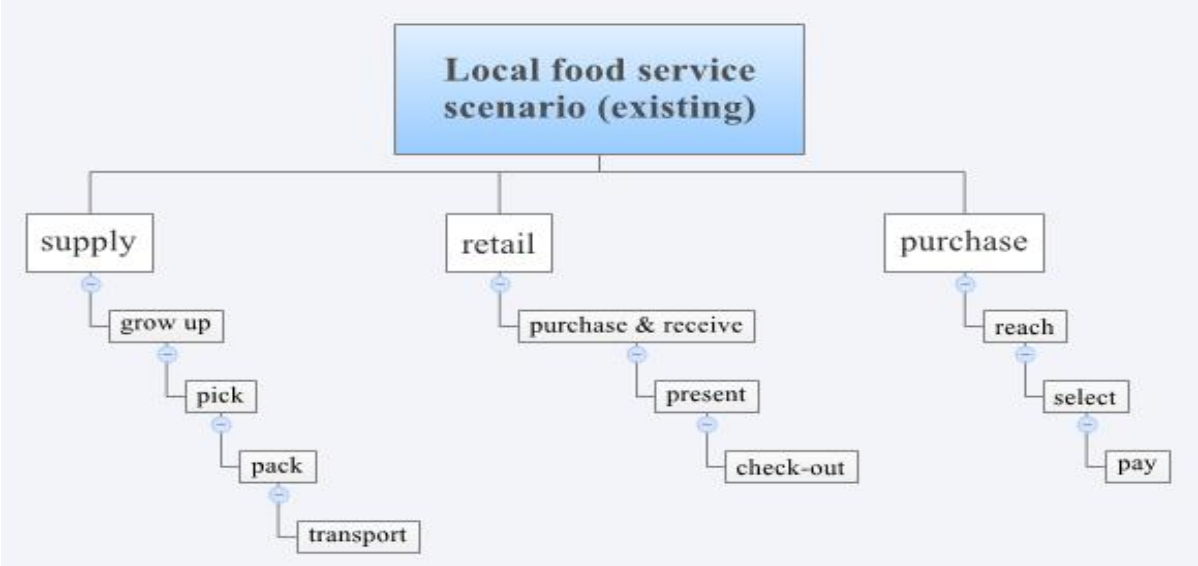


Figure 16. Main and sub-functions in the existing LFS scenario

Local vegetables follow the process of growing and being picked, packed and transported to the retailer within the *supply* function. The local supplier is the allocated resource for the supply. The purchasing order, payment and feedback from the hypermarket are inputs, while the local vegetable in bulk and information to the hypermarket are outputs of the supply function. Supplying activities are controlled by agricultural regulations. Refer to the appendices, page 59, to see the detailed IDEF0 diagram of supply sub-functions.

In *retailing*, there are purchase and receive, present and check out sub-functions. The hypermarket and its utilities are the allocated resources. The payment and feedback from consumers, besides local vegetables in bulk and information from suppliers (outputs of supply), are inputs for retailing. The outputs are retailed vegetables, information for consumers (about prices, produce, etc.) and payment and feedback to the local suppliers. The retailing regulations are the controls on retailing.

Purchasing is done by consumers. They obtain local food from the retailer and information from the hypermarket as inputs. When they purchase, the outputs are purchased vegetables, payment and feedback to the hypermarket. Consumer purchasing is controlled by the consumers' budgets, personal initiatives and bills at the end of their shopping. Reach, select and pay sub-functions within purchasing are presented in the IDEF0 diagram in the appendices, page 60.

The current local food assessment criteria are quality, price, availability, traceability and uniqueness due to the consumers' sensitivity on these issues.

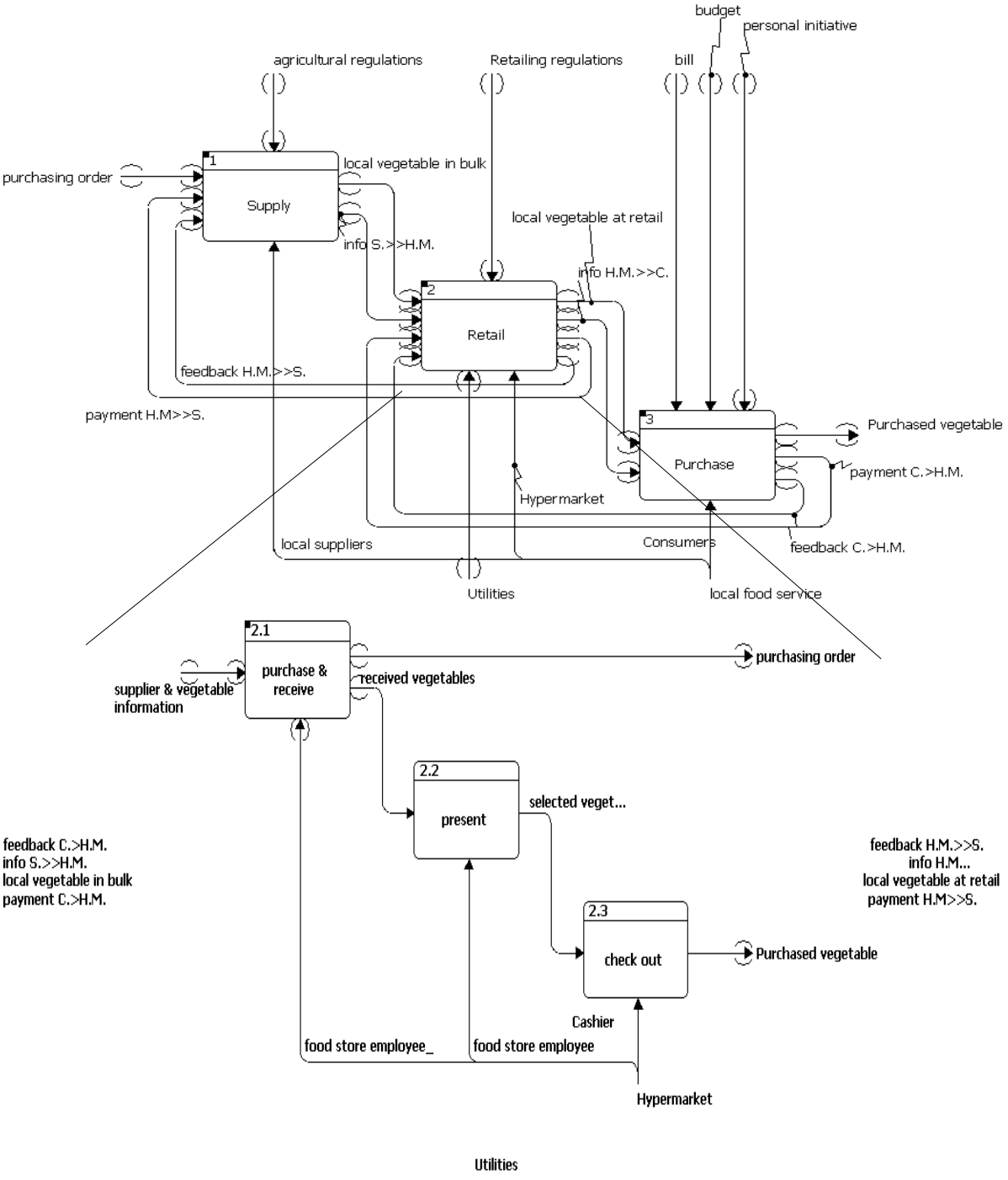


Figure 17. Existing local food service scenario IDEF0 representation

6.1.b Needs analysis and stakeholder requirements

The collected needs and voices of stakeholders in 5.2.c are structured and converted into requirements, as shown in Table 2.

Table 2. List of voice and needs, and requirements

		Voice & Needs	Requirements
Local producer	1	They are afraid of losing their uniqueness if they supply to a hypermarket.	preserve uniqueness
	2	They lose contact with their own customers when they use a middleman for their sales.	contact with consumers
	3	They need support to survive and grow, not to be part of a hypermarket's business.	self-sufficiency
	4	They are worried about future pressure on the amount and timing of supply if they co-develop with a hypermarket.	guaranteed flexibility
	5	They perceive the hypermarket as a competitor not a co-developer.	co-development initiation/fair & co-operative trading
	6	They are concerned about preserving their process and produce quality if they produce in bulk.	improved land welfare & contribution to local food culture
Hypermarket	1	Does sustainability add value to their service?	increased demand
	2	Sustainability factors need to be defined and a sustainability index built up for produce so that these can be used in decision making.	defined sustainability factors/sustainability index
	3	They want to have a better understanding of the local produce in the area.	investigation of local producers
	4	They want to know the potential local producers for co-development.	list of potential local producers
	5	They want to know what actions to take and which way to go when deciding on local vegetables and bringing them to the shelf.	documentation & standardization
	6	How can they ensure that the consumers will know about the local produce and that it will be sold?	marketing & visibility
	7	Is sustainability a concern for consumers?	added value sustainability measures
	8	They want to co-develop with local producers.	local producer willingness
Consumers	1	They want high quality vegetables.	guaranteed quality
	2	They want to know where the vegetables come from.	traceable produce
	3	They want local vegetables to be distinguishable.	visibility
	4	They want local vegetables to be unique.	unique produce
	5	They are willing to pay more as long as they are informed about where their money goes/it remains in the local area.	reasonable price & employ local labour
	6	They are not willing to travel a long distance to buy local produce.	accessibility

6.1.c Refining the stakeholders' requirements

Satisfying all the requirements of all stakeholders would be outstanding, but it is a utopic idea considering the size and limitations of any study. The stakeholders' requirements therefore need to be revised and refined to have a core development focus, for which the necessary manoeuvres are still reasonable with regard to satisfying the surrounding requirements. Ultimately, the main requirements to be satisfied for the hypermarket are

- *Increased demand*
- *Local producer willingness*
- *Sustainability-related requirements*

The requirements with coloured frames in Figure 18, Figure 19 Figure 20 are also taken into account during the identification of the service concepts and the development of the sustainability criteria.

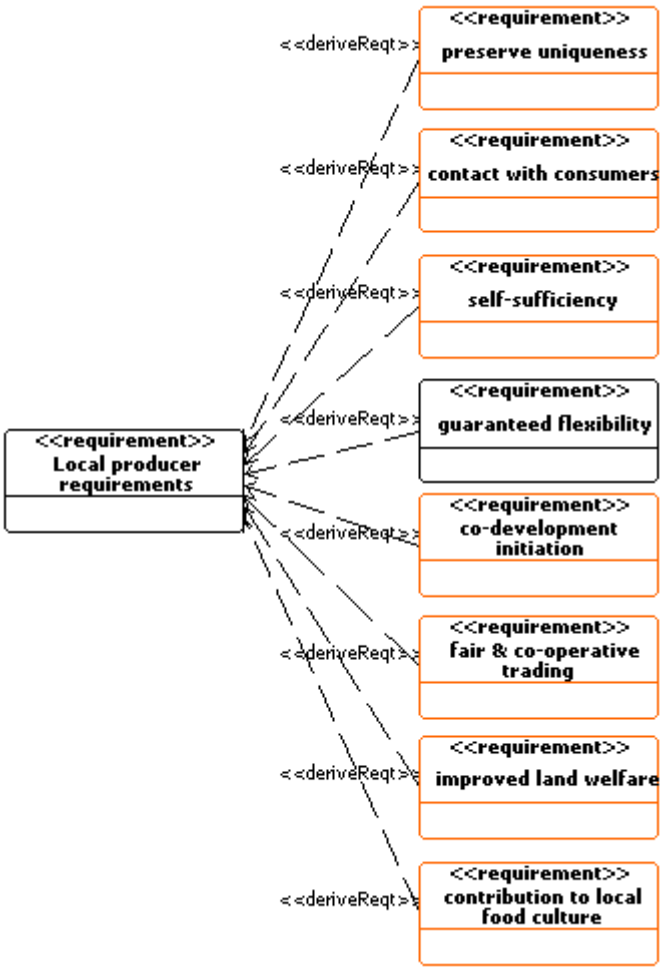


Figure 18. Local producer requirements

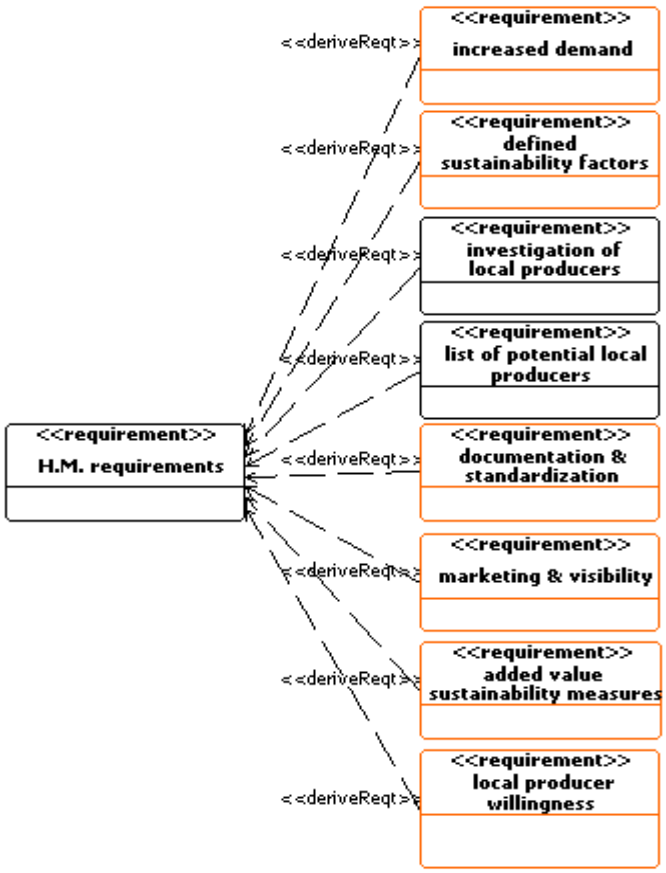


Figure 19. Hypermarket requirements

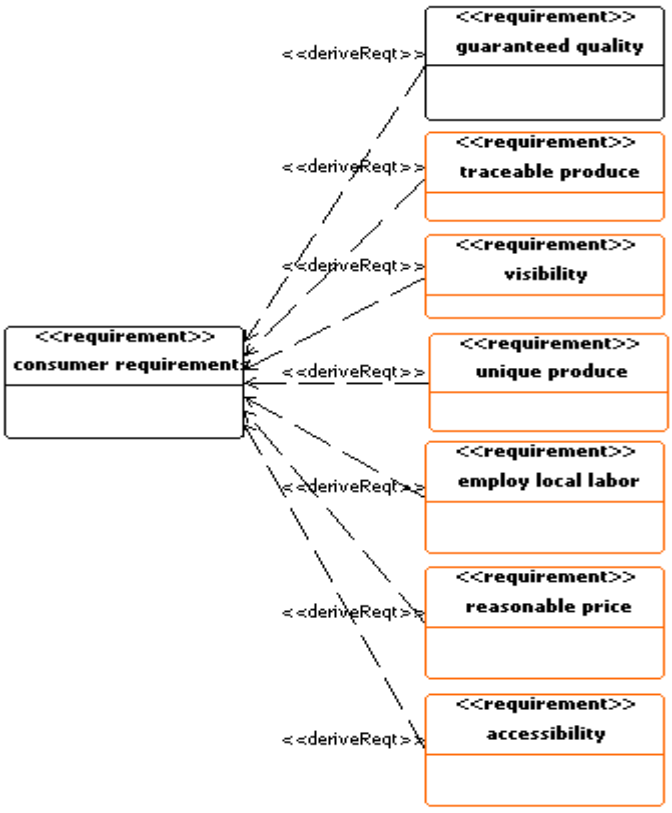


Figure 20. Consumer requirements

6.1.d Sub-function to develop

The LFS development needs to consider consumer requirements in order to *raise the demand* for local vegetables. The development must show concern for local producers and make them happy. They should then be *willing to co-develop* the local vegetable business with the hypermarket. On the other hand, the shopkeeper wants to *involve sustainability criteria* into his business in such a way that it adds value. Briefly, the development of a sub-function should bring higher performance for both the consumers and local producers in a sustainable way.

When the current sub-functions within retailing (purchase and receive, present, check out) and the main requirements mentioned are put together, *presenting local vegetables* is the sub-function in which the consumer, hypermarket and local producer interact (or have the opportunity to interact). The identified service concepts therefore focus on presenting in 6.2.b.

Added value sustainability in LFS can be achieved by introducing sustainability criteria for assessing local produce and local producers and letting consumers know about the hypermarket's sustainability concerns. As there is no matching function for sustainability assessment and marketing in the existing LFS scenario, a new function *assess and market* is proposed prior to *purchase and receive* in the enhanced scenario.

6.2 Module 3: Synthesis of the service concept

6.2.a Sustainability criteria development

Sustainability criteria are developed based on the refined stakeholders' requirements. The terms are supported by the SUSTAIN sustainability performance measures used by Ilbery and Maye (2005). Thus, the identified concepts are evaluated according to their success at matching the developed criteria in Section 6.2.c.

- *High quality:* regards the desired quality of local vegetables
- *Employ local labour:* whether the service concept helps local labour employment
- *Contribution to local food culture:* whether the concept contributes to the emergence and development of the local food culture
- *Accessibility:* considered to affect local food purchase decisions by consumers
- *Environmental benefit:* the basic well-known aspect of sustainability questions the environmental impact and benefits of the service concept
- *Socially inclusive:* the number and group of people involved in the LFS scenario are important. It refers, in particular, to different employee profiles such as old people, enabled or students.
- *Fair and cooperative trading:* whether the service concept helps equity, fair trade and cooperatives, such as farmer cooperatives, to play a role in the market.
- *Land welfare:* the service concept is asked to contribute to land welfare for the continuity of local produce.

- *Visibility:* whether the service concept makes the local produce visible and noticeable to consumers. It is one of the important factors for consumers to buy local, besides having a major effect on marketing.
- *Political/ethical concern:* to satisfy consumers who decide on their purchase based on political (i.e. regional borders) or ethical (i.e. they may want to support a smaller farmer cooperative) issues.

Table 3 shows the impact factors of the sustainability criteria on economic, environmental and social performance.

Values from 1 to 3 are used to express impact levels: lowest=3, medium=2 and highest=1.

Table 3. List of developed sustainability criteria and their impact on economic-environmental and social performance

	Impact on sustainability performance		
Developed sustainability criteria	Economic	Environmental	Social
high quality	2	3	1
traceable	2	3	1
unique	2	3	1
visible	2	3	1
accessible	2	3	1
socially inclusive	2	3	1
supports local producers	1	3	2
environmentally beneficial	3	1	2
contributes local food culture	3	2	1
fair & co-operative trading	2	3	1
land welfare	2	1	3
political/ethical concern	2	3	1
required investment	1	3	2
usability	2	3	1

6.2.b Service concept identification

LF Shelf (base concept): Using a separate shelf to present local vegetables is the base concept and the current practice of retailers today; see Figure 21.

Figure 21. View of a local food shelf in a supermarket

LF among others: Local vegetables are distributed with other vegetables. For instance, local tomatoes are on a shelf among all the other tomatoes. Their local identity is only visible on their labels.

Informative LF shelf: More information is given to consumers through labelling or brochures on the shelf, i.e. about the producer (increases *traceability*, satisfies *political/ethical concerns of consumers*, may contribute to *fair and cooperative trade)*, CO_2 emissions and growing conditions (*environmentally beneficial*), as shown in Figure 22.

Figure 22. Information transfer alternatives for local vegetables

LF bazaar: Farmers meet consumers and serve their local vegetables themselves in an allocated bazaar area in the hypermarket on a specific day of the week or based on an agreed schedule. An example bazaar view is shown in Figure 23. Meeting and communicating with the farmers satisfies the consumers who seek *traceability* for the local vegetables so they know where their vegetables come from and who they support (*supporting local producers, fair and cooperative trading*) by buying local vegetables. Farmers, on the other hand, will be satisfied with the guaranteed *uniqueness* of their produce in the market. Such a bazaar in a hypermarket is obviously interesting, and it would be outstanding in terms of *visibility*, though the *investment need* must be considered.

Figure 23. Local food bazaar

LF footprint: Consumers have a chance to design their shopping with the help of this service concept. According to the vegetable type desired by the consumer, the LF footprint shows alternative locations of local producers, as shown in Figure 24 (would satisfy *politically/ethically concerned* consumers and producers who want to keep their *uniqueness*). Consumers are also informed about the distance between the farm and the hypermarket,

which may affect their decision in terms of being *environmentally beneficial;* the type of producer (individual small/medium/large farm or cooperatives) so that they can contribute to *fair and cooperative trading;* the number of employees; and the employee profile of the farm (employing able people, students, old people, etc.) so that they can choose to *support local producers* and contribute LFS to be *socially inclusive.* The LF footprint has good *visibility*, though usability may be a challenge for a varying consumer profile, i.e. elderly people. It also *requires investment* in information and communication technologies.

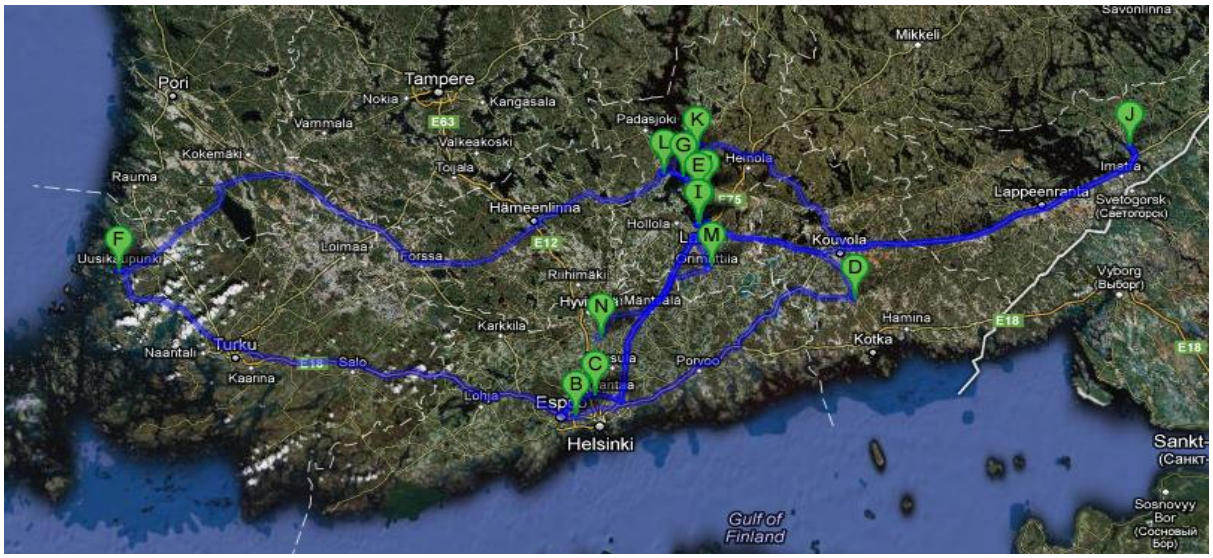


Figure 24. Example mapping of alternative vegetable suppliers

LF show: Stories are always a good way to give a message rather than pure information. The LF show tells the story of vegetables from the farm to the consumer (i.e. on a screen in the café of the hypermarket), as shown in Figure 25. The show of real stakeholders during the processes contributes to *traceability*, *uniqueness*, and *fair and cooperative trading*. It is *visible*, as it attracts consumers visually. The *investment* need is acceptable.

Figure 25. Local food show

Local kitchen stand: This is a similar concept to the current food stands in hypermarkets that allow consumers to experience local food; see Figure 26. Presenting alternative food recipes and cooking, and letting consumers taste them is a *visible* concept and may contribute to *local food culture*. On the other hand, it may not make sense at local vegetable sales as it is already a common way of promoting a variety of produce.

Figure 26. Local kitchen stand

LF journey: This service concept shows the consumers' engagement in and commitment to their hypermarket through the collection of sustainability points. The LF journey informs them about the consequences of their local vegetable purchase, as in Figure 27. This way, as more consumers purchase local produce, more consumers contribute to the sustainability grade of their hypermarket. This sustainability grade is presented on a screen and increases with the purchase of local produce. It also allows consumers to see how the money flows through various channels (the hypermarket, logistics, farm employees, farmers, land welfare, recycling, etc.) in terms of sustainability points in order to sustain the economic, social and environmental performance of the stakeholders involved in the LF journey. It is updated automatically and *visibly*, and it visualizes the consumers' shopping, guarantees *uniqueness of local producers* and supports them, encourages *fair and cooperative trading*, and involves stakeholders in the shopping. *Socially inclusive* contributes to *LF culture* and *land welfare*. It *requires investment* in information and communication technologies.

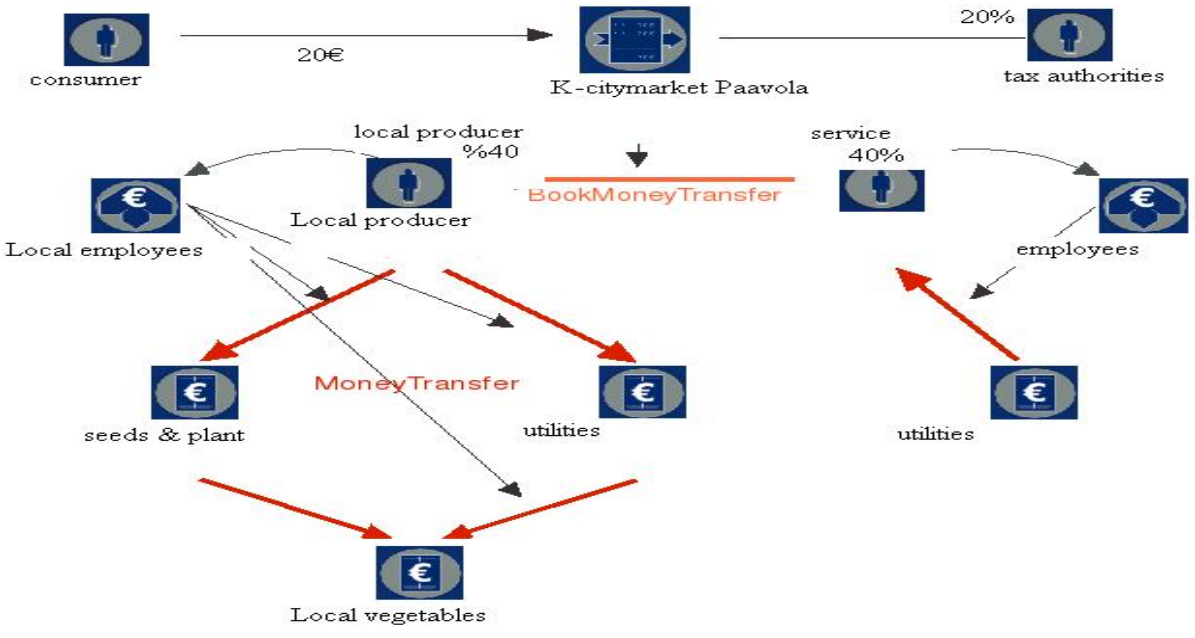


Figure 27. Logic of local food journey

6.2.c Service concept evaluation and selection

The Pugh matrix is used to evaluate different service concepts in terms of developed sustainability criteria. The sustainability criteria are listed in the rows and the identified concepts placed in the columns. The evaluation is done on a scale of 1 to 5: 1=poor, 2=marginal, 3=accepted, 4=good and 5=outstanding.

High quality and accessibility of local vegetables are excluded from the considered criteria as:

- The presentation has no major impact on the quality of vegetables.
- The accessibility of local vegetables in the hypermarket is supposed to be outstanding (5) regardless of the different presenting concepts.

Table 4. Pugh Matrix for evaluating LF presentation concepts

		Presentation concepts							
		LF shelf (base concept)	**LF among others**	**informative LF shelf**	**LF bazaar**	**LF footprint**	**LF show**	**local kitchen stand**	**LF journey**
Sustainability criteria	**traceable**	2	2	3	5	4	4	3	4
	unique	1	1	2	5	5	4	2	4
	visible	2	1	2	5	4	5	4	4
	socially inclusive	1	1	2	3	3	2	2	5
	supports local producers	2	2	2	4	4	3	2	4
	environmentally beneficial	2	2	3	2	5	3	2	4
	contributes to LF culture	1	1	2	3	3	3	3	4
	fair & cooperative trade	1	1	3	4	5	4	2	5
	land welfare	2	2	2	2	4	3	2	5
	political/ethical concern	2	2	3	3	4	3	2	4
	required investment	4	5	4	3	2	3	4	3
	usability	4	3	4	5	3	4	4	5
	Total	**24**	**23**	**32**	**44**	**46**	**41**	**32**	**51**

The LF journey, LF footprint and bazaar have the highest total values. After this step, a workshop is arranged with the shopkeeper to validate the adequacy of the developed sustainability criteria and the applicability of the identified concepts in order to continue on the right track for the rest of the thesis.

6.2.d Service concept validation

After careful examination of the current LFS scenario, developed sustainability criteria and identified concepts together with the shopkeeper, the following points were highlighted:

- In the current LFS scenario, there was a lack of information flow between functions, so the shopkeeper asked for possible improvements in this regard.
- The presentation may have an impact on the quality of produce. For instance, presenting strawberries on a cold shelf prolongs their life, as room temperature has an adverse effect on them.

- The shopkeeper's previous experience showed that presenting local bread on a separate shelf had a positive effect on sales. He expressed the importance of the ease (usability) of the concept for consumers. Could this be discussed for vegetables as well? *LF among others* was added to the evaluation matrix as an alternative concept in response to this thought.
- The shopkeeper thought that using both an informative LF shelf and an LF journey would be useful to the hypermarket. The LF journey was his favourite concept in terms of being attractive and simple.
- He also thought that the LF show and LF kitchen stand were do-able.
- The LF footprint looked interesting, but he wanted to test and validate its usability and commercial performance before applying it. He therefore thought it might require a decision at hypermarket chain level due to the investment need.
- He described his experience of the LF bazaar, which we had not talked about before, and it was interesting to hear that he had already tried it. In the previous hypermarket, they had tried the LF bazaar with local producers twice. Even though the hypermarket employees and local producers were excited about trying the new concept and expected people to be interested in it, the bazaar idea did not succeed in terms of its low commercial benefits compared with its costs. The shopkeeper therefore emphasized the commercial performance of the concept as the key factor to surviving.
- One important conclusion based on the bazaar trial was that the result may have been completely different in other country contexts. The shopkeeper said that Finnish consumers preferred not to interact with each other (even with producers) during their shopping; they would rather pick their produce in silence.

Finally, the LF journey was approved as the most influencing service concept in the LFS scenario. The LF journey is the system of interest (SoI) that is developed through steps in 6.3.

6.3 Module 4: Service concept development

6.3.a SoI concept requirements

The boundaries of the LF journey are defined in a context diagram, as shown in Figure 28. Arrows indicate the input/output relation between entities (stakeholders) and how they interact with each other. The active stakeholders of the LF journey are the surroundings within the boundary. They have two-way interactions with the LF journey. For instance, the LF journey sends data to the database and the database sends sorted data back, and the user enters data for the LF journey and the LF journey monitors data to the user. Passive stakeholders are outside the boundary and their interaction is only one-directional: the hypermarket database provides data for the LF journey while the food store provides a facility for it.

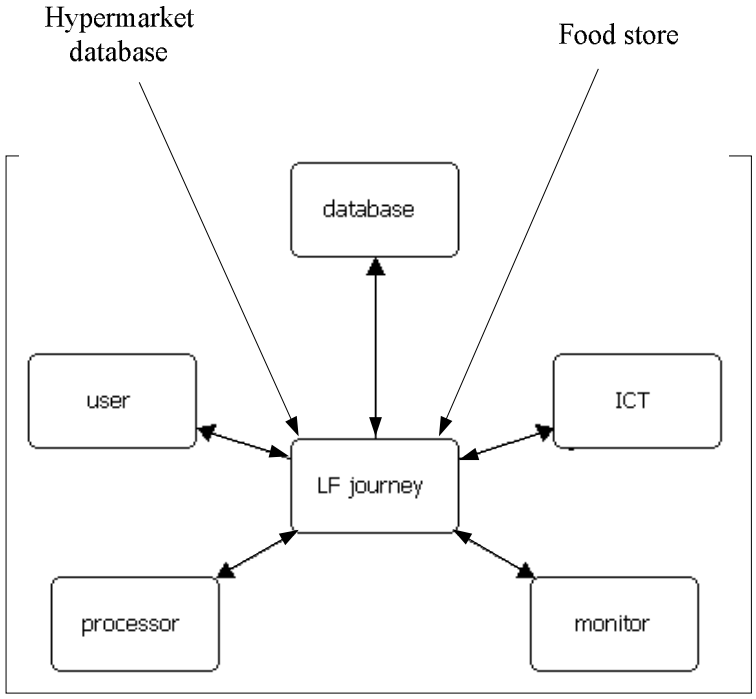


Figure 28. Context diagram of the LF journey

Figure 29 shows how the described entities in the context diagram interact with each other during operation. The drawn use case helps to identify input/outputs in the IDEF0 diagram of the LF journey in 6.3.b.

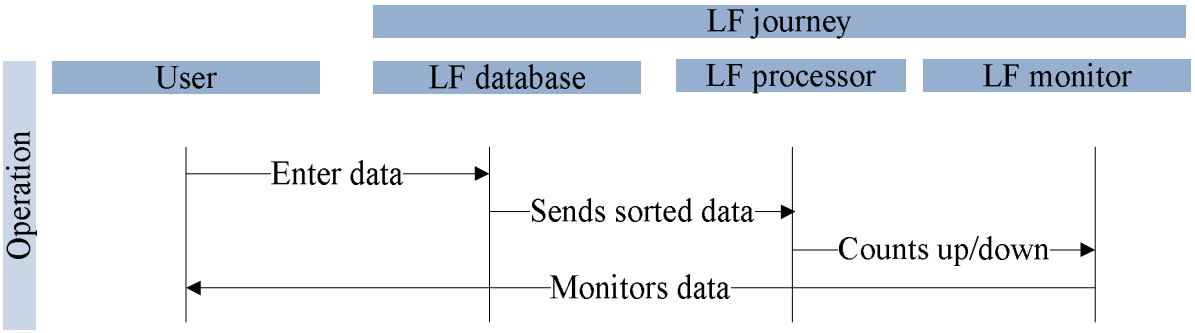


Figure 29. Use case scenarios of the LF journey

The functional requirements of the LF journey are acquiring, analysing and visualizing data. The specifications that need to be considered during the allocation of physical components, in the physical architecture of the service concept, are given in Figure 30.

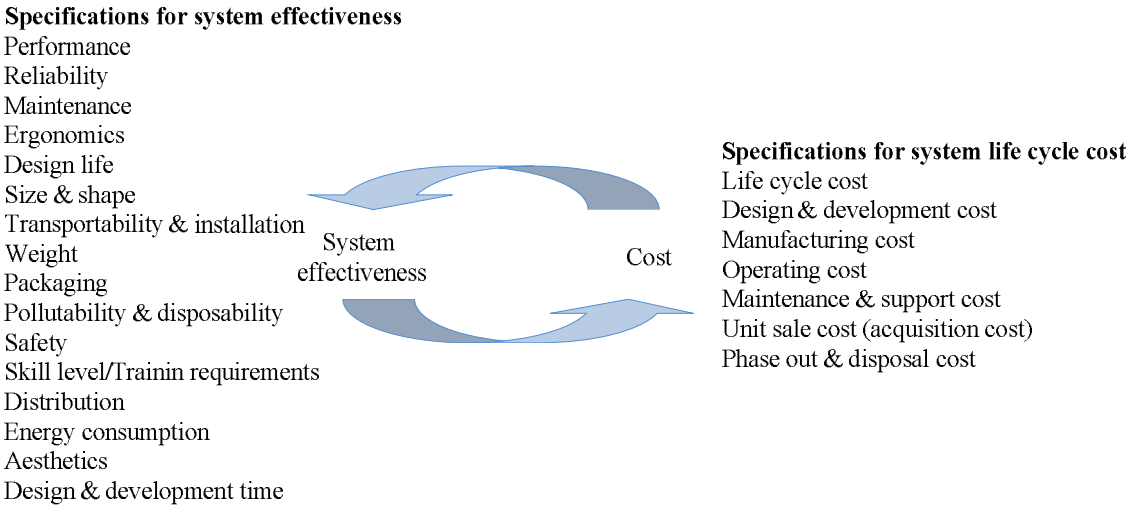


Figure 30. Specifications (non-functional requirements) of the LF journey

6.3.b Architecture of the developed concept

The LF journey consists of three functions: acquire, analyse and visualize; see Figure 31. Data and energy are the main inputs for the acquire function. Output is the monitored data after it is acquired, analysed and visualized. The database, processor and monitor are the allocated resources, and there is one common trigger for the three functions: the reference number against which the data are counted.

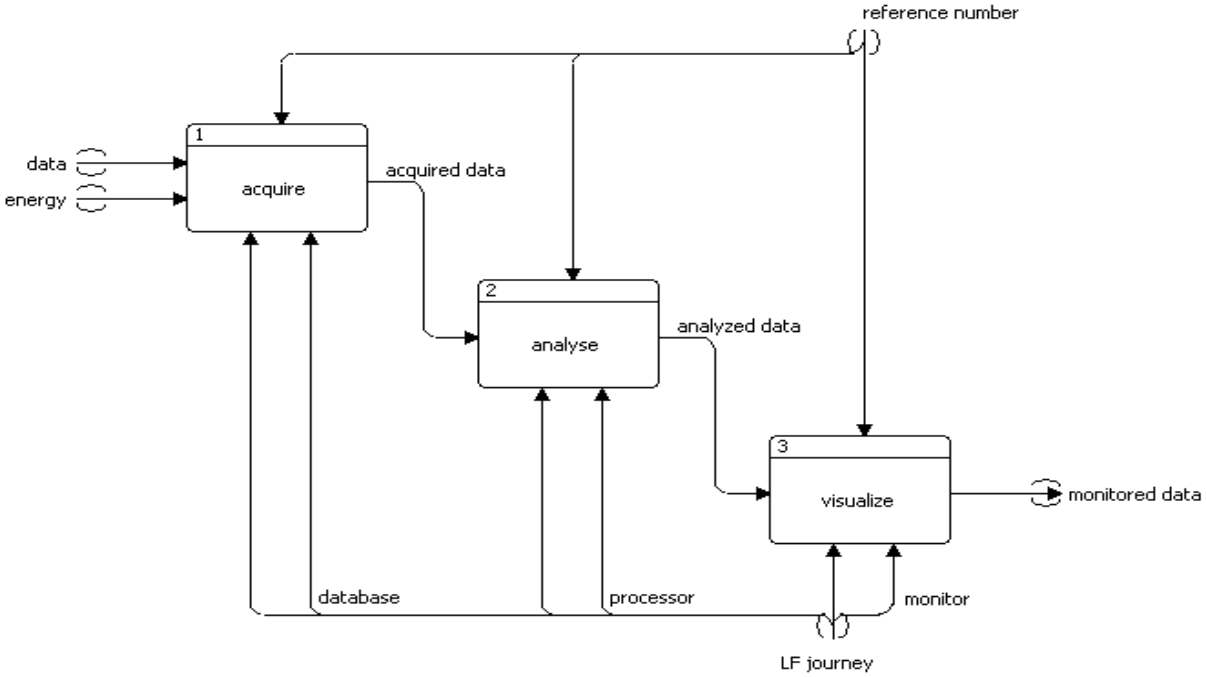


Figure 31. Developed functional architecture of the LF journey

6.4 Module 5: Enhanced scenario integration

6.3.a Integration and architecture of the enhanced LFS scenario

The complete LF journey architecture and a new function called assess and market are integrated into the LFS scenario, as shown in Figure 32. Assess and market is the function that assesses local vegetables according to the developed sustainability criteria and markets them. The LF journey is a new mechanism for presentation that enables effective information flow, and it is the visible face of the sustainability activities in assess and market.

The expected influence on the LFS system scenario due to the enhanced sub-functions of retailing are the new controls on the supply, retail and purchase functions, the enhanced information transfer from local producers and the hypermarket to consumers, and a co-development initiative from the hypermarket to local suppliers.

The supply of local vegetables is controlled by the *sustainability index*, which is parallel to the *sustainability criteria* of the hypermarket. The hypermarket carries the sustainability flag. When it informs consumers about the practical issues regarding sustainability, it also co-develops with local producers based on the common perspectives and corresponding understanding towards local food business and sustainability. Consumers are oriented to *consider sustainability* during their local vegetable purchase with effective presentation of local vegetables.

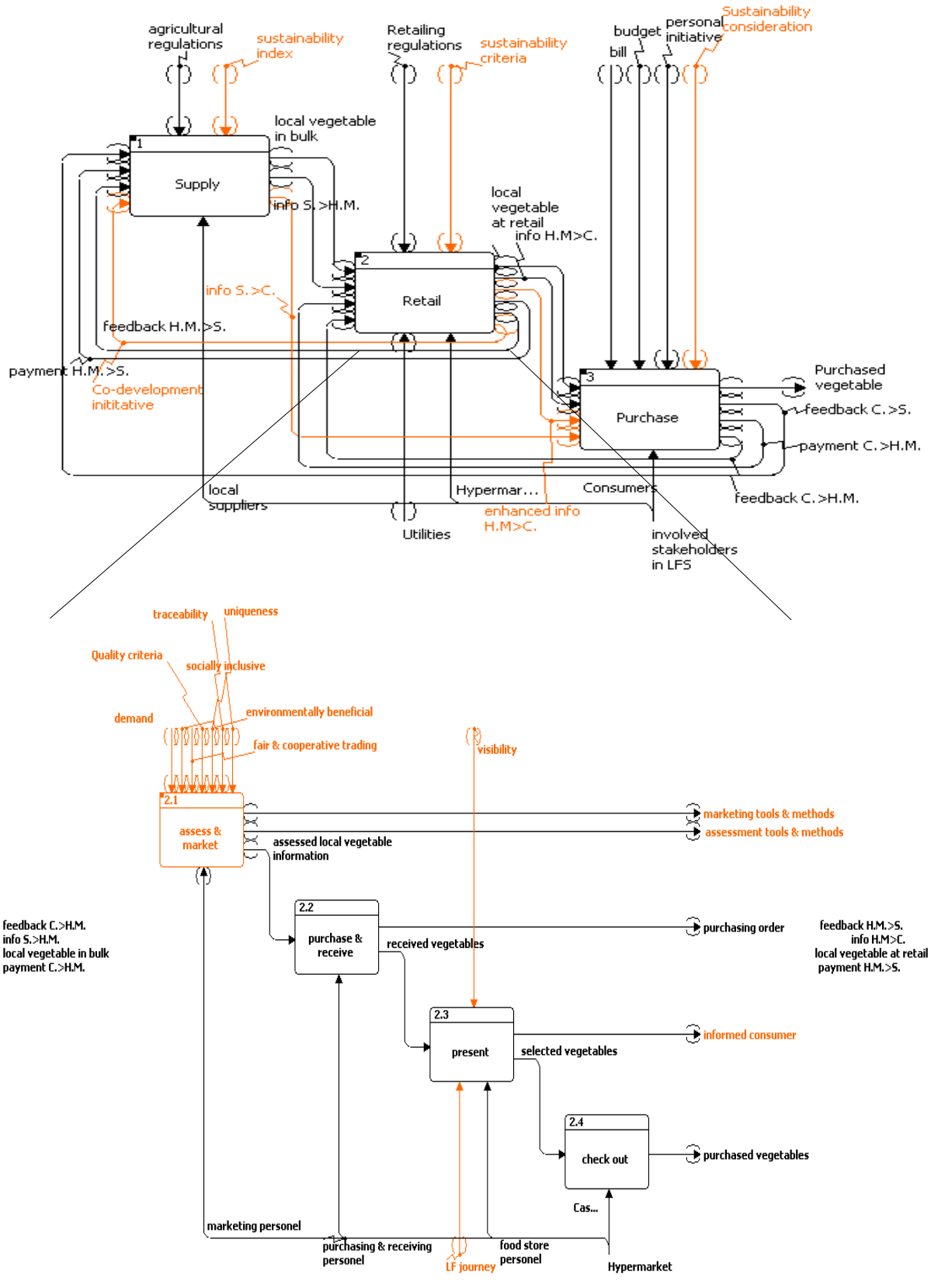


Figure 32. Integrated local food service scenario

6.3.b Risk and potential mitigations

'Low supply' is a possible risk related to the supply function in the enhanced LFS scenario. In the case of insufficient vegetable supply from local producers, support for the local economy (particularly local producers) should be increased. In order to mitigate this risk, the *supply amount*, *supply local economy* and *sales rate* are related. The *supply amount* is fed by *support local economy*, and *support local economy* is fed by *sales rate* in the LFS simulated model; see Figure 33. Thus, the hypermarket and local producers emerge from a mutually beneficial loop.

'Early expiration' is a risk related to retailing and expressed by the shopkeeper. Possible mitigations are to present heat-sensitive vegetables, i.e. strawberries, on a cooled shelf, supplying them more often in smaller amounts, or pricing them lower than others and making a profit from bigger amounts. These mitigations can be reflected in the cost elements in the simulated model in order to see the effect on the overall performance of the LFS.

'Misunderstanding/misinterpreting the LF journey' is the purchase-related risk. Starting from the criteria development up to integration, the consumers are considered in order to avoid this risk; though feedback from consumers may indicate that there is more to do. Collecting feedback is the suggested mitigation.

6.3.c Enhanced LFS scenario validation

The developed service concept and its integration into the enhanced LFS scenario are approved by the shopkeeper at the conceptual level, although the question is about how to test and view the applicability and commercial performance of that co-development attempt. Existing and enhanced LFS scenarios are modelled and simulated in 6.5 in order to verify the LFS scenario development and give approximate results regarding the scenarios' sustainability performance.

6.5 Module 6: Performance comparison

Existing and enhanced LFS scenarios have been modelled and simulated in the Vensim System Dynamics software; see Figure 33. Thus, the system (scenario) behaviour is examined and the effect of the developed service concept (LF journey) on the entire LFS scenarios could be interpreted.

The supply and sales rates (shown as valves) have been modelled as probability distributions. The auxiliary variables in relation to stocks contain constant or variable values. While stocks accumulate, the arriving data, auxiliary variables stay the same or are updated by iteration.

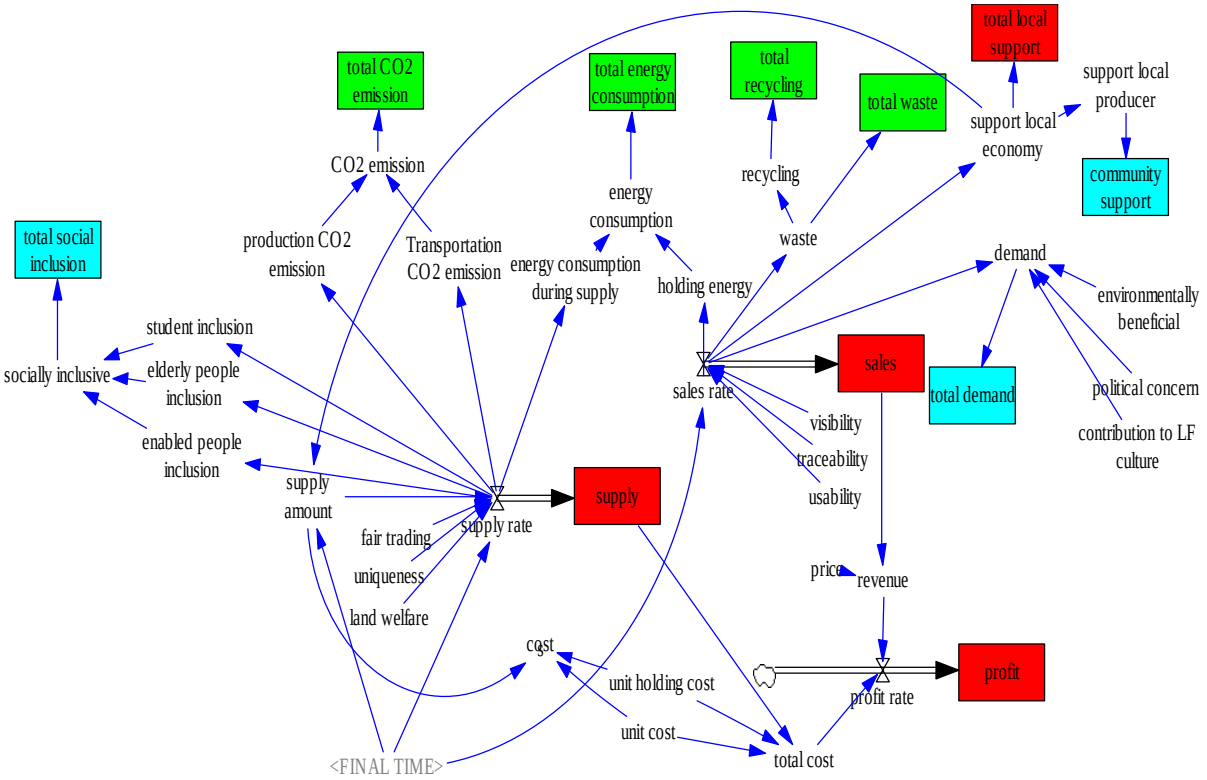


Figure 33. System dynamic modelling of LFS scenario

A comparison graph of supply and sales in the current and enhanced scenarios is shown in Figure 34 and Figure 35 when the simulation is run for a two-year period (720 days). In both graphs, the seasonality of local vegetables is highlighted. The local vegetables are available in the second half of the year. While the supply is weekly, that sales are daily. The change in auxiliary variables results in a higher mean and lower standard deviation for both supply and sales in the enhanced LFS scenario.

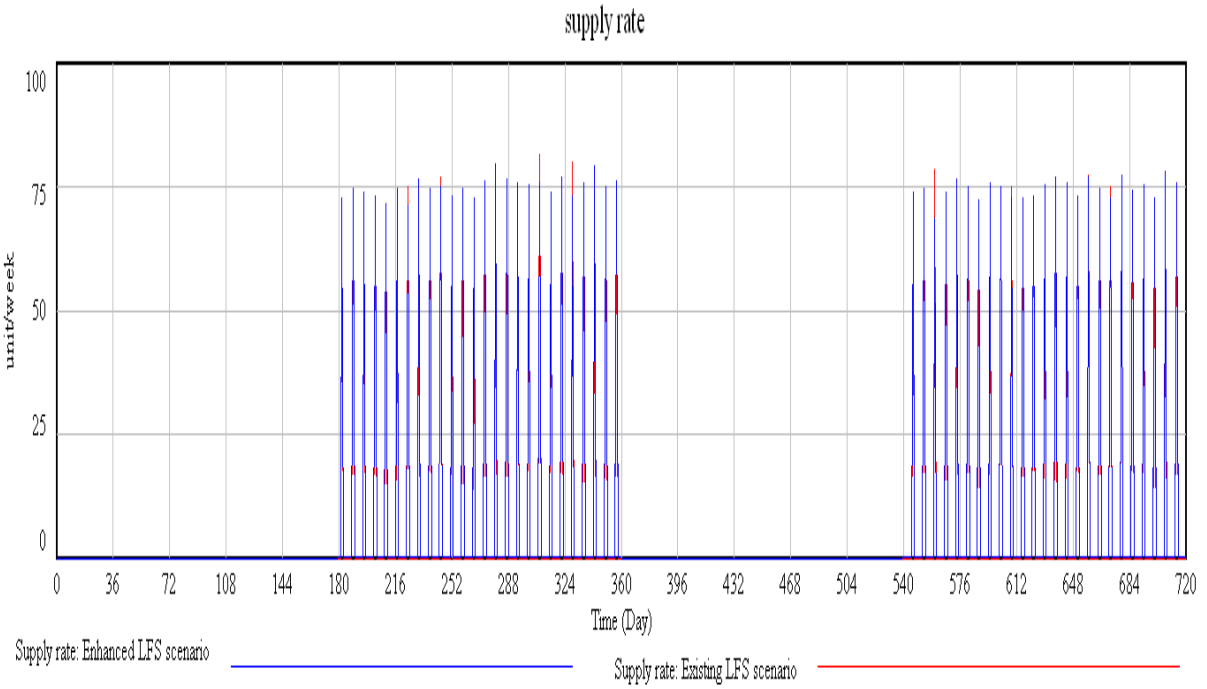


Figure 34. Supply rate for existing and enhanced LFS scenarios

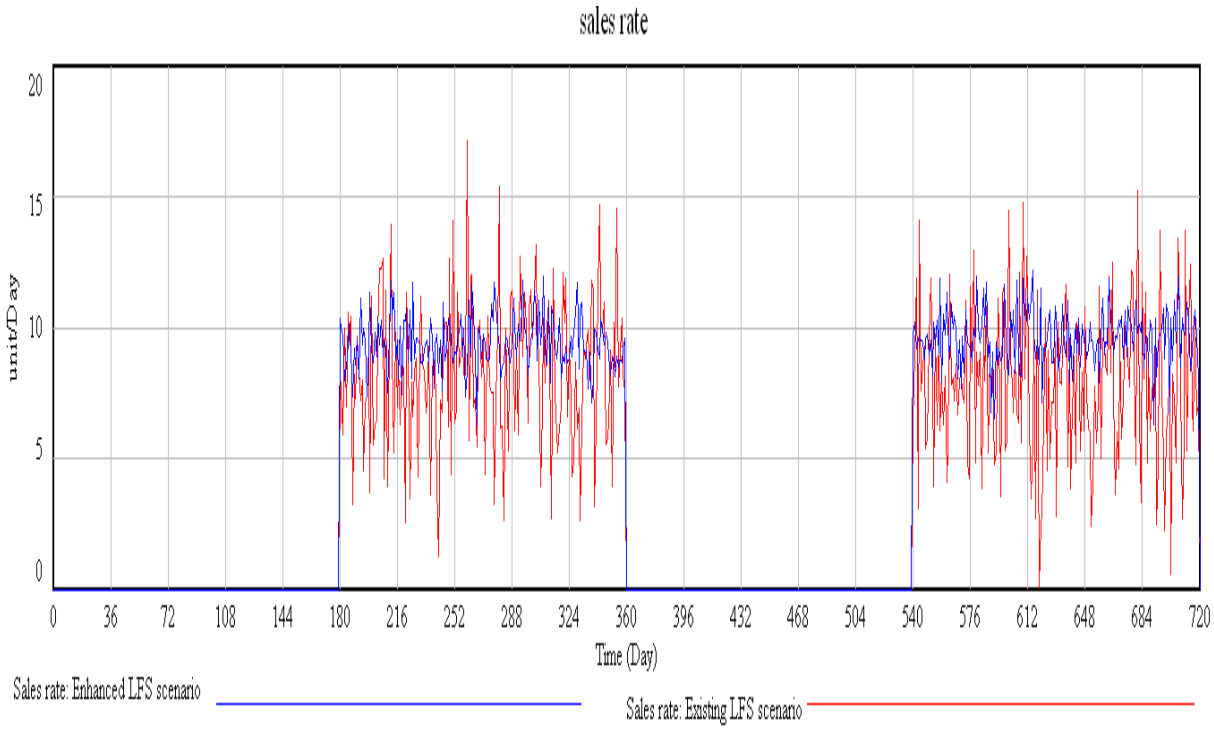


Figure 35. Sales rate for existing and enhanced LFS scenarios

To see the effect of the LF journey, fair trading, uniqueness and land welfare have been used as influencing factors for supply (auxiliary variables to the supply rate), as they were the main requirements of the local producers (suppliers). Visibility, traceability and usability contribute to the sales rate due to their priority in the consumers' eyes. Environmentally beneficial and political concern contribute to the LF culture and are influencing factors for demand (they may not have a direct effect on sales, though they affect demand over time). The measured indicators are shown in blue, green and red boxes according to their sustainability group (social, environmental and economic).

The sustainability performance indicators in the groups (inspired by Jones et al. (2005)), shown in Figure 36, have been used to compare two scenarios.

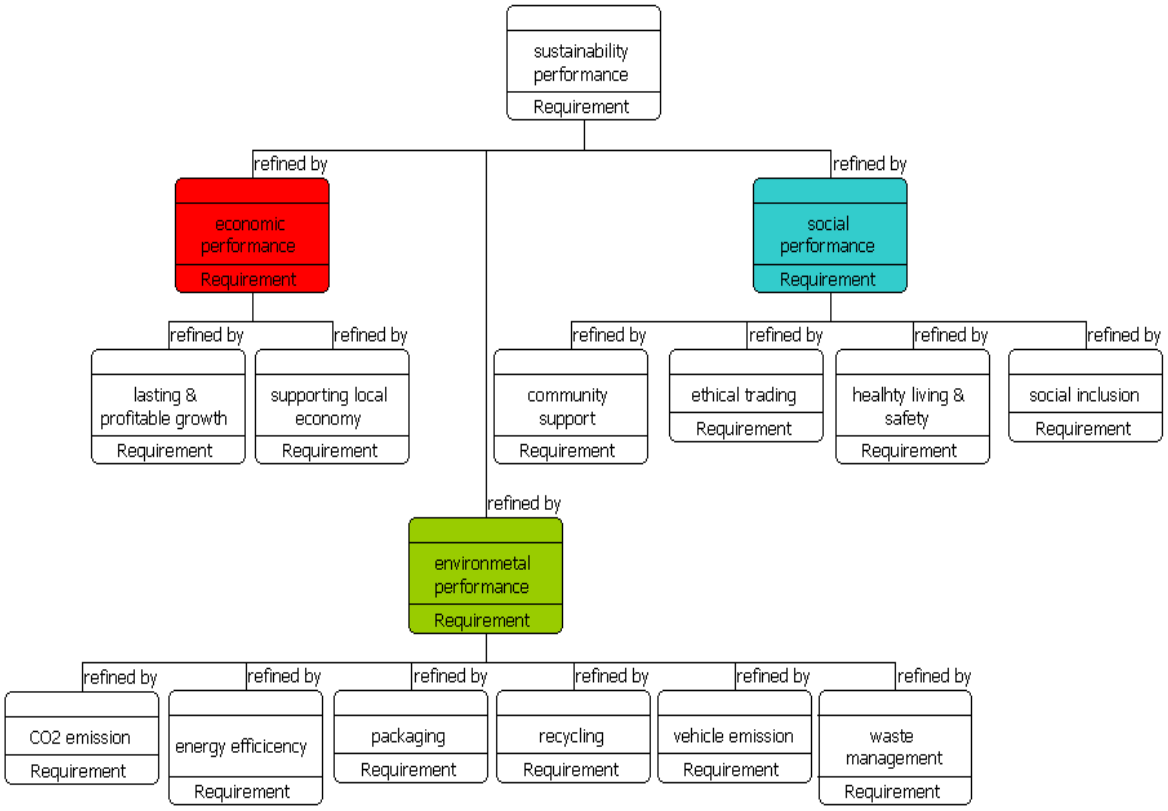


Figure 36. Considered sustainability performance indicators for LFS scenario comparison

When it comes to healthy living and safety, ethical trading, water consumption and packaging, existing and enhanced LFS scenarios have the same level of sustainability. Differing indicators and LFS scenario performances are highlighted on a spider diagram in Figure 37.

Figure 37. Sustainability performance of existing and enhanced LFS scenarios

The spider diagram shows particular aspects of enhancement in the LFS scenario. Given the three main requirements (increased demand, increased supplier willingness and the added value sustainability consideration in LFS development), the simulation results show that it is very difficult to improve social, environmental and economic sustainability at the same ratio in parallel.

In the hypermarket case, economic sustainability increases most when a new service concept and function are introduced to the LFS scenario. Sales, supply, lasting and profitable growth and support for the local economy are the economic indicators used.

Secondly, social performance has increased due to the involvement of more (in number and different profile) people and community support by LFS activities.

On the contrary, environmental sustainability shows negative change in the enhanced LFS scenario. Since the environmental consequences such as CO_2 emissions, energy consumption, and waste are related to the percentage of supply and sales amounts, when the supply and sales amounts increase they increase in parallel, meaning an increase in environmental impacts and lower environmental sustainability performance.

6.6 Results

6.6.a Results of enhanced LFS scenario and sustainability performance

The developed concept, *LF journey*, contributes to the information flow in the LFS. Its contribution is the continuous required data regarding various stakeholders and factors in the LFS and continuous, updated monitored data for consumers. This two-sided information flow results in a sustainability index requirement for local producers and enriched sustainability awareness and its actual consideration in purchasing.

The *assess and market* function helps to carry out the actual sustainability assessment of local food and supports marketing in the hypermarket. The developed sustainability criteria are actually used within the function. They gain importance for the control of the retailing of local vegetables.

Involving added value sustainability into LFS is done by introducing sustainability criteria for assessing local produce and local producers and letting consumers know about the hypermarket's sustainability concern in this case.

System dynamic modelling of the LFS scenario highlights more details that need to be taken into account in the local food business. The seasonal character of local food influences the supply and sales through the year. Enhancement of the LFS scenario results in higher average supply and sales with lower standard deviation. This means more stable supply and sales of local vegetables in the season when they are available.

Economic performance: higher supply and sales are reached by increasing the influencing criteria values (developed criteria) connected to the supply and sales rates. This also implies an increase in profits.

The social performance of the LFS scenario increases due to the positive feed from sales to support the local economy, employing more and various groups of people and community support.

Environmental factors are functions of supply and sales. An increase in supply and sales leads to an increase in the environmental impact, so no enhancement in environmental sustainability is observed, though there should also be a conventional vegetable supply in the sustainability performance comparison in order to have the relative results in the figure.

6.6.b Results of the SELF development model

The SELF development model is the main outcome of the thesis. Its applicability is verified and partially validated. The results of the development of the SELF development model and the implementation of it in the hypermarket case are as follows.

Module 1 This results in a better understanding of the LFS stakeholders' roles and relations, and a list of their needs regarding sustainability.

Module 2 In order to ultimately satisfy the hypermarket's requirements, the consumer and local producer requirements are considered mainly for developing sustainability criteria and identifying service concepts. Understanding the current LFS scenario has helped in figuring out which sub-function in retailing to focus on and develop. *Presenting* has been the focus of the sub-function in this case, and it has a significant role in retailing in terms of connecting consumers and local producers.

Module 3 Listing the current LF assessment criteria has been the preliminary step in developing sustainability-based assessment criteria. The developed criteria are the first set of measures proposed for the hypermarket for use in its LF assessment. A new function, *assess and market,* has been added to the LFS scenario so that the hypermarket has the initiative for its LF assessment and marketing activities.

Module 4 Identifies and assesses concepts in terms of developed criteria to enable further development of the service concept based on the requirements. Latterly, validating the service concept with the shopkeeper has helped elaborate on the LF journey. The main result of the module is the functional architecture of the service concept.

Module 5 An integrated LFS is the main outcome. Possible risks related to functions in the LFS are also defined, and possible mitigation alternatives are discussed.

Module 6 The outcomes of this module are a system dynamics simulation model of the LFS scenarios and comparison results. A simulated LFS provides an understanding of the behaviour, and a clear demonstration of the type of relations, interactions between entities and consequences of possible market changes in the system. Developed sustainability criteria (for service concept assessment) and sustainability performance indicators (from literature) are considered with respect to functions in the simulation model, and their effect could be measured at system level. A sustainability performance comparison clearly shows the challenge of sustaining all three dimensions of sustainability during LFS development.

7. DISCUSSION AND FUTURE WORK

Sustainability and local food in literature: Sustainability is a multifaceted (Charter & Tischner 2001) and ambiguous concept with wide coverage, as long as it is not operationalized for asset managers (Marlow 2006). Hence, it is crucial to introduce it to different stakeholders with aspects with which they are familiar. The stakeholders will then not be concerned by a speech about a fuzzy concept that does not actually mean much to them.

There are previous studies that have examined the sustainability of local food systems, such as Ilbery and Maye (2005) who investigated whether local or alternative food supply systems really are sustainable. They assess the economic, environmental and social sustainability of six speciality food supply chains on the Scottish/English borders. The conclusion is that the examined speciality food supply chains are driven mainly by an economic imperative. They therefore accommodate many features of conventional supply chains. Vasileiou (2002) attempts to develop and apply a framework in order to assess the sustainability of supply chains for the fresh potato industry in the UK. Moreover, Vasileiou and Morris (2006) present the perceptions of potato growers, merchants and retailers of the three dimensions of sustainability: economic, environmental and social factors, in a case study in the UK.

Sustainable service development: These studies point to the degree of sustainability of existing local food systems. There is a lack of systematic descriptions regarding the development of sustainable LFS however. The systems engineering process was therefore used to provide traceability of the LFS development process, and the SELF development model emerged. Within this frame, when the seasonality and limited availability of LF are considered, it would be of value to discuss whether LF on its own is dependable to satisfy the high demand of consumers in a hypermarket. Ilbery and Maye (2005)'s conclusion about accommodating features of conventional supply is then valid.

System modelling: System dynamics modelling of LFS provides an understanding of the relations between variables and provides a chance to visualize the influence of variables on system performance. In parallel, the data used in the simulation are based on estimation and a number of assumptions, so the limitations need to be considered for a generalization. For instance, LFS is not an isolated service within food retailing in a hypermarket, so, high or low sustainability performance of the LFS does not fully imply sustainable retailing and vice versa. When consumers purchase local vegetables, they probably do not purchase conventional vegetables at the same time. In this case, negative environmental performance of LFS may therefore be neutralized or even overcome and improved by the effect of reduced food miles. These examples show the complexity and need to examine real context conditions. However, conducting this study contributes to the understanding of LFS and its development process in a hypermarket context, and modelling is a useful way to discover the relations and influence at system level.

Challenges: The thesis theme is wide and new. Neither of the concepts have a consensus or a standard approach for service development. Sustainability and local food have therefore been

investigated with the glasses of a service developer. Moreover, it is a theory building with the help of comprehensive literature review and a case based learning outcomes rather than just applying an existing method in a case. Both framing the work and ensuring that every needed aspect is covered appear to be the primary challenges then.

Latterly, it could be easier to communicate with natives and consider more perspectives in the study if there were no language barriers regarding Finnish. Some national studies and available texts in Finnish regarding the theme would have been used more effectively.

Future work: A comparison of sustainability performance between local and conventional vegetable supplies is needed. In contexts in which a conventional vegetable supply is a must beside local food, this comparison adds value in terms of highlighting divergence and possible improvement aspects of sustainability.

Moreover, the characteristics of local vegetables in different geographic contexts are worth further investigation in LFS development. Since 'local' is identical for regions, the LFS development process requires adjustments according to varying stakeholder needs, consumer attitudes and intentions, and local produce variety in different geographical contexts.

It is still challenging to trace the effect of the used criteria through the hypermarket shelves, interpret the consumers' attitudes, give measurable values to them and present the real effect in concrete numbers. For more precise results, a further study needs to be conducted to make these criteria measurable and find out what their effect is on sales, supply, demand, etc.

A recommendation for the hypermarket on consumer feedback could be a similar mechanism to the one used in the student restaurant. In this example, there were two glass pipes (with the symbols ☺ and ☹) in the entrance to the restaurant into which customers put plastic stones when they left. They could pick up and put in as many stones as they wanted from the stone pile according to their satisfaction with the service. Placing such feedback panels in the food store with questions like "*Why did you choose local potato?"* and options like *"clear where it comes from"*, "*looks high quality"* and "*supports farmer*" could make consumers look at and think about their shopping rationale, allow the hypermarket to find out its customers' preferences and make these preferences (criteria) measurable.

8. CONCLUSIONS

This thesis has been seeking the answer to the following research question:

- How can sustainability add value to local food service development in a hypermarket context?

Sustainability can add value to local food service development in a hypermarket context based on the highlighted indicators on the spider diagram in Figure 37. It triggers development of LFS in a hypermarket through performance measures.

A sustainability-based service development model provides a systematic roadmap for added value sustainability in local food businesses. In this thesis, the SELF development model has undertaken the task of operationalizing sustainability and proposing added value for a hypermarket's local food business. It is identified based on the logic and systematic way of the systems engineering process. Thus, it considers sustainability in terms of stakeholders' needs, sustainability assessment criteria, an LFS scenario, service concepts, functions, and sustainability performance indicators.

The local food definition varies according to the needs of the business. Local vegetables, in this sense, need to be considered both as local and seasonal, as the availability of local vegetables is low through the year, especially in a Nordic country like Finland. Other groups of available local food, i.e. bread and meat, need to be used in order to preserve the added value sustainability. Vegetables needed throughout the year can be satisfied by a combination of local and conventional ones. Yet, once the sustainability criteria and indicators are set out as influencing factors for the decision making on the vegetable supply in the hypermarket, they can also provide useful guidelines for the conventional vegetable supply.

Taking into account the stakeholders' needs and perspective on sustainability, developing recognizable and understandable sustainability measures for them and presenting co-development platforms enhances a common understanding of sustainability and lets it be alive, dynamic and adds value for stakeholders in retailing. As the common understanding matures, commitment and support for sustainable actions increase. Hypermarkets have the advantage of connecting consumers and local producers at this point. They have the power to shape the market in a sustainable way. An understanding of LFS and the sustainable service development process in a hypermarket context is therefore critical, and this thesis is conducted based on this.

9. REFERENCES

Alam, I. & Perry, C., 2002. A customer-oriented new service development process. *Journal of Services Marketing*, Vol. 16 (Iss: 6), pp.pp.515 - 534.

Aras, G. & Crowther, D., 2008. Governance and sustainability: An investigation into the relationship between corporate governance and corporate sustainability . *Management Decision*, Vol. 46 (Iss: 3), pp.pp.433 - 448.

Arponen, J. & Ottelin, H.-L., 2011. From trendy to main stream. *sitri.fi*. Available at: http://www.sitra.fi/en/organic-and-local-food [Accessed April 25, 2012].

Baldwin, C., 2009. *Sustainability in the food industry* 1. ed. Cheryl Baldwin, ed., Wiley-Blackwell/IFT Press.

Banks, J. et al., 2005. *Discrete-Event System Simulation*, United States of America: Prentice Hall.

Bhattacharya, C.B., Korschun, D. & Sen, S., 2011. What really drives value in corporate responsibility? *McKinsey Quarterly*.

Blanchartd, B.S. & Fabrycky, wolter J., 2011. *Systems engineering and analysis* 5th ed., NJ: Pearson.

Bourlakis, M.A. & Weightman, P.W.. eds., 2004. *Food supply chain management*, Blackwell publishing.

Carlsson-Kanyama, A. et al., 2008. Participative backcasting: A tool for involving stakeholders in local sustainability planning. *Futures*, 40(1), pp.34-46.

Charter, M. & Tischner, U. eds., 2001. *Sustainbale solutions*, Sheffield, UK: Greenleaf.

DOD, 2001. *Systems engineering fundamentals*, Virginia: Department of Defense, Systems Management Collage.

Delai, I. & Takahashi, S., 2011. Sustainability measurement system: a reference model proposal. *Social Responsibility Journal*, 7(3).

Dunne, J.B. et al., 2010. What does "local" mean in the grocery store? Multiplicity in food retailers' perspectives on sourcing and marketing local foods. *Renewable Agriculture and Food Systems*, 26(01), pp.46-59.

Garvare, R. & Isaksson, R., 2001. Sustainable development: extending the scope of business excellence models . *Measuring Business Excellence*, Vol. 5 (Iss: 3), pp.pp.11 - 15.

Grönroos, C., 2006. Adopting a service logic for marketing. *Marketing Theory*, 6(3), pp.317-333.

Hamprecht, J. et al., 2005. Controlling the sustainability of food supply chains. *Supply Chain Management: An International Journal*, Vol. 10 (Iss: 1), pp. pp.7 - 10.

Ilbery, Brian & Maye, Damian, 2005. Food supply chains and sustainability: evidence from specialist food producers in the Scottish/English borders. *Land Use Policy*, 22(4), pp.331-344.

Ilbery, B. & Maye, D., 2006. Retailing local food in the Scottish–English borders: A supply chain perspective. *Geoforum*, 37(3), pp.352-367.

James, P., 2001. Towards sustainable business? In M. Charter & U. Tischner, eds. *Sustainable solutions*. Greenleaf.

Jones, P. et al., 2005. Sustainable Retailing and Consumerism. *Management Research News*, 28(1), pp.34-44.

Jones, P., Comfort, D. & Hillier, D., 2008. Moving towards sustainable food retailing? *International Journal of Retail & Distribution Management*, 36(12), pp.995-1001.

Kaasinen, E. et al., 2011. Involving users in service co-creation. In P. Vähä et al., eds. *VTT Symposium on Service Innovation*. Espoo.

Khan, S., 2010. Food security and sustainability: Community food initiatives in London. In D. E. Taylor, ed. *Environment and Social Justice: An International Perspective* . Emerald Group Publishing Limited.

Labuschagne, C., Brent, A. c. & Erck, R.P.G. van, 2005. Assessing the sustainability of industries. *Journal of cleaner production*, 13, pp.373-385.

Liyanage, J.P., 2007. Operations and maintenance performance in production and manufacturing assets: The sustainability perspective. *Journal of Manufacturing Technology Management*, Vol. 18(Iss: 3), pp.pp.304 - 314.

Liyanage, J.P., Badurdeen, F. & Ratnayake, R.M.C., 2009. IndustrialAsset Maintenance and Sustainability Performance: Economical, Environmental and Societal Implications. In M. Ben-Daya et al., eds. *Handbook of Maintenance Management and Engineering*. Springer.

Marlow, D R, 2006. Sustainability based asset management. In 06P. of E., ed. *Conference and Exhibition on" Building Sustainable Cities."* Melbourne.

Marlow, David R, 2010. Sustainability-Based Asset Managementin the Water Sector. In *Definitions, Concepts and Scope of Engineering Asset Management* . London: Springer, pp. S. 261-275.

Matthing, J., Sandén, B. & Edvardsson, B., 2004. New service development: learning from and with customers. *International Journal of Service Industry Management*, 15(5), pp.479-498.

Matthyssens, P. & Vandenbempt, K., 1998. Creating competitive advantage in industrial services. *Journal of Business & Industrial Marketing*, Vol. 13 (Iss: 4/5), pp.pp.339 - 355.

Mikkola, M., 2009. Shaping professional identity for sustainability. Evidence in Finnish public catering. *Appetite*, 53(1), pp.56-65.

Mäkipeska, T. & Sihvonen, M., 2010. *Lähiruoka, nyt!*, SITRA.

Norberg-Hodge, H. & Gorelick, S., 2012. Bringing the Food Economy Home. *ISEC*. Available at: http://www.localfutures.org/publications/online-articles/bringing-the-food-economy-home [Accessed April 24, 2012].

Närhinen, M., Nissinen, A. & Puska, P., 1999. The municipal food control can Healthier choices in a supermarket. *Public Health*, 101(2), pp.99-107.

Porter, M.E. & Kramer, M.R., 2011. Creating Shared Value. *Harvard Business Review*.

Roininen, K., Arvola, A. & Lähteenmäki, L., 2006. Exploring consumers' perceptions of local food with two different qualitative techniques: Laddering and word association. *Food Quality and Preference*, 17(1-2), pp.20-30.

Rozelle, J.T., 2010. Event Planning : Marketing Local Food. Available at: www.eatlocalfood.com [Accessed March 14, 2012].

SAC, 2007. *Local Food Marketing Guide*, Aberdeen.

SDC, 2008. Green, healty and fair. Available at: www.sd-commission.org.uk/publications/downloads/GreenHealthyAndFair.pdf [Accessed March 15, 2012].

Seyfang, G., 2007. Growing sustainable consumption communities: The case of local organic food networks". *International Journal of Sociology and Social Policy*, 27(3/4), pp.120 - 134.

Shiflet, A.B. & Shiflet, G.W., 2011. System Dynamics Tool: Vensim PLE Tutorial 1. In *Introduction to Computational Science: Modeling and Simulation for the Sciences*. Princeton University Press.

Sonnino, R. & Marsden, T., 2006. Alternative Food Networks in the South West of England: Towards a New Agrarian Eco-Economy? In T. Marsden & J. Murdoch†, eds. *Between the Local and the Global*. Emerald Group Publishing Limited, pp. pp.299-322.

Stahel, W.R., 2001. Sustainability and services. In M. Charter & U. Tischner, eds. *Sustainable solutions*. Greenleaf.

Steger, U., Ionescu-Somers, A. & Oliver, S., 2007. The economic foundations of corporate sustainability. *Corporate governance*, Vol. 7(Is. 2), pp.PP: 162-177.

Sundkvist, Å., Jansson, A. & Larsson, P., 2001. Strengths and limitations of localizing food production as a sustainability-building strategy — an analysis of bread production on the island of Gotland, Sweden. *Ecological economics*, 37(2), pp.217-227.

UN, 1987. *Report of World Commission on Environment and Development: Our Common Future*, Available at: http://www.un-documents.net/wced-ocf.htm [Accessed March 1, 2012].

Vargo, S.L. & Lusch, R.F., 2004. Evolving to a New Dominant Logic. *English*, 68(January), pp.1-17.

Vasileiou, K. & Morris, J., 2006. The sustainability of the supply chain for fresh potatoes in Britain. *Supply Chain Management: An International Journal*, Vol. 11 (Iss: 4), pp.pp.317 - 327.

Vasileiou, K.Z., 2002. *Towards a framework for asssessing the sustainability of supply chains: the case of potatoes in Britain*. Cranfield university at Silsoe.

Ventana, 2005. Vensim PLE Online Tutorial. Available at: http://www.shodor.org/tutorials/vensim/btm0.php [Accessed May 24, 2012].

Ventana, 2012. Vensim simulation software. Available at: http://www.vensim.com/software.html [Accessed May 24, 2012].

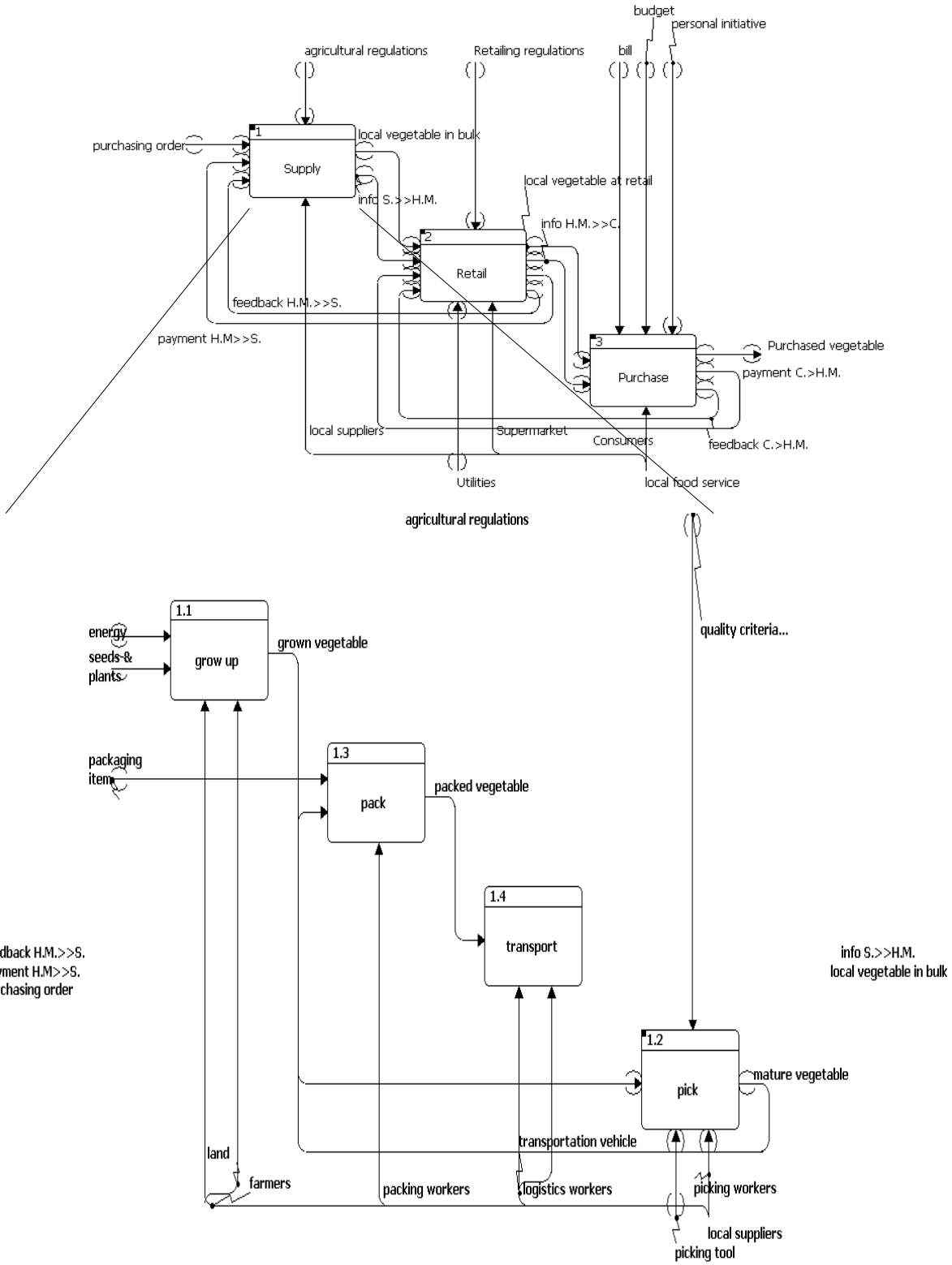
Verna, A., 2000. The value evolution: Addressing larger implications of an intellectual capital and intangibles perspective. *Journal of Intellectual Capital*, Vol. 1 (Iss: 1), pp.pp.17 - 32.

Vitech, 2011. *Core 8 - Systems Engineering Guided Tour*, Virginia.

Yin, R.K., 2003. *Case study research: desing and methods* 3. ed., USA: SAGE Publications, Inc.

10. APPENDICES

I. Sub-functions in SUPPLY



II. Sub-functions in PURCHASE